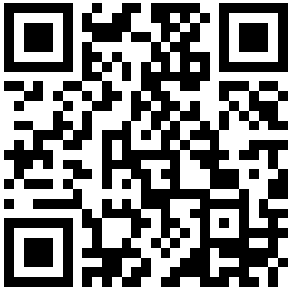
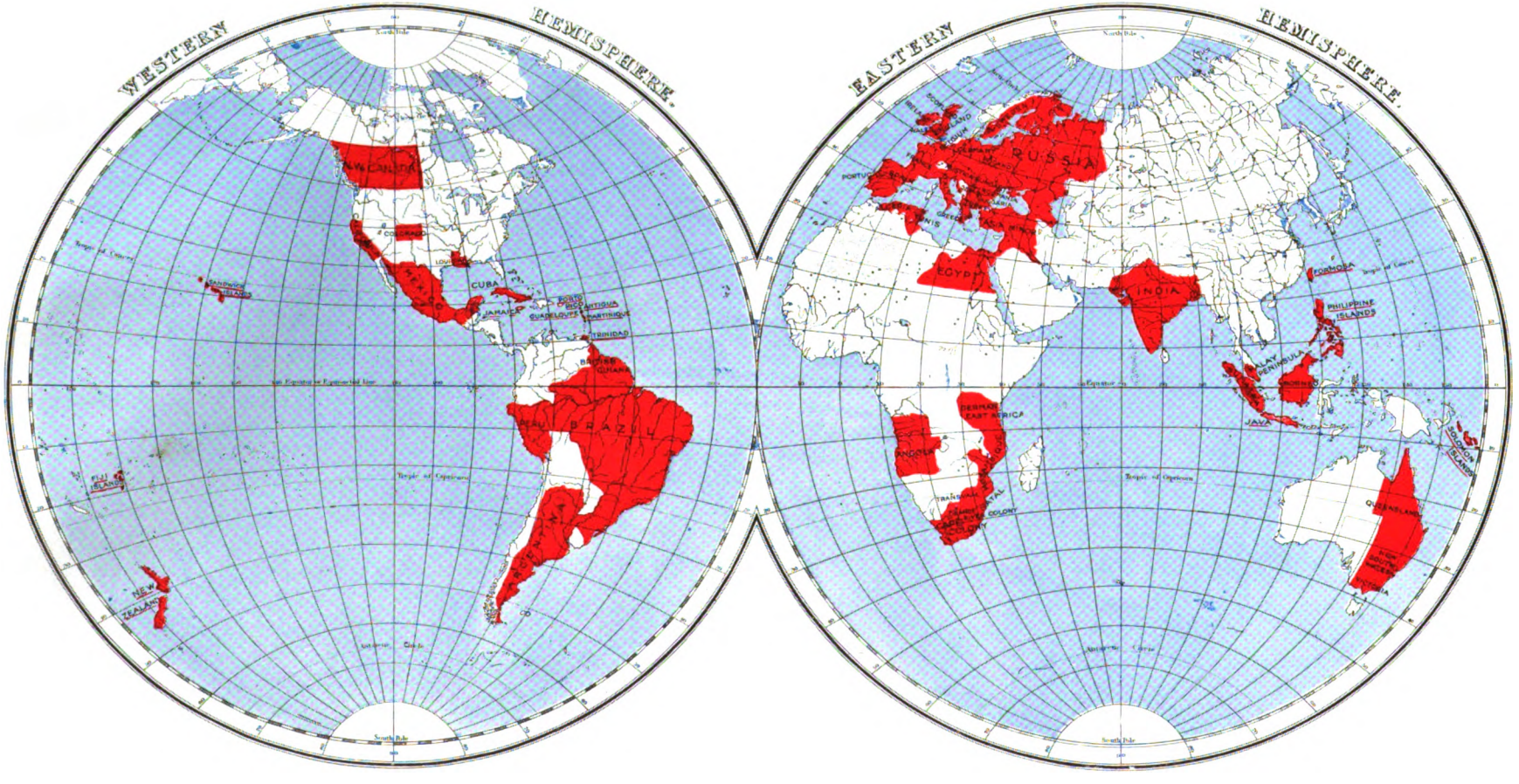
STEAM CULTIVATING MACHINERY

JOHN FOWLER & Co. (Leeds), Ltd.
STEAM PLOUGH & LOCOMOTIVE WORKS
LEEDS, England



FOR EVERY COUNTRY FOR EVERY CLIMATE FOR EVERY CROP



Fowler's Steam Cultivating Machinery is in use all over the world, and can be seen at work in the countries coloured Red on the map.

John Fowler & Company (Leeds) Limited,

ENGINEERS,

Steam Plough and Locomotive Works, Leeds,

AND

6, Lombard Street, London, E.C.

Contractors to

H.M. War Department. The Lords of the Admiralty. The Council of State for India. The Crown Agents for the Colonies. British, Russian, German, French, Italian, Spanish, Portuguese, Hungarian, Austrian, Natal, Egyptian, Abyssinian, and Afghanistan Governments. The Agents General for New South Wales, Queensland and the Cape of Good Hope.

European Branches:

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BERLIN, N.W.	Schiffbauerdamm 21.
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Indian and Colonial Branches:

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BOMBAY	Canada Buildings, Hornby Road.
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"Fowler," Leeds.
"Steamplow," London.
"Fowler," Magdeburg.

Telephone Nos.:

Leeds—Central, 513.
London—Central, 8384.

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Western Union (1900).
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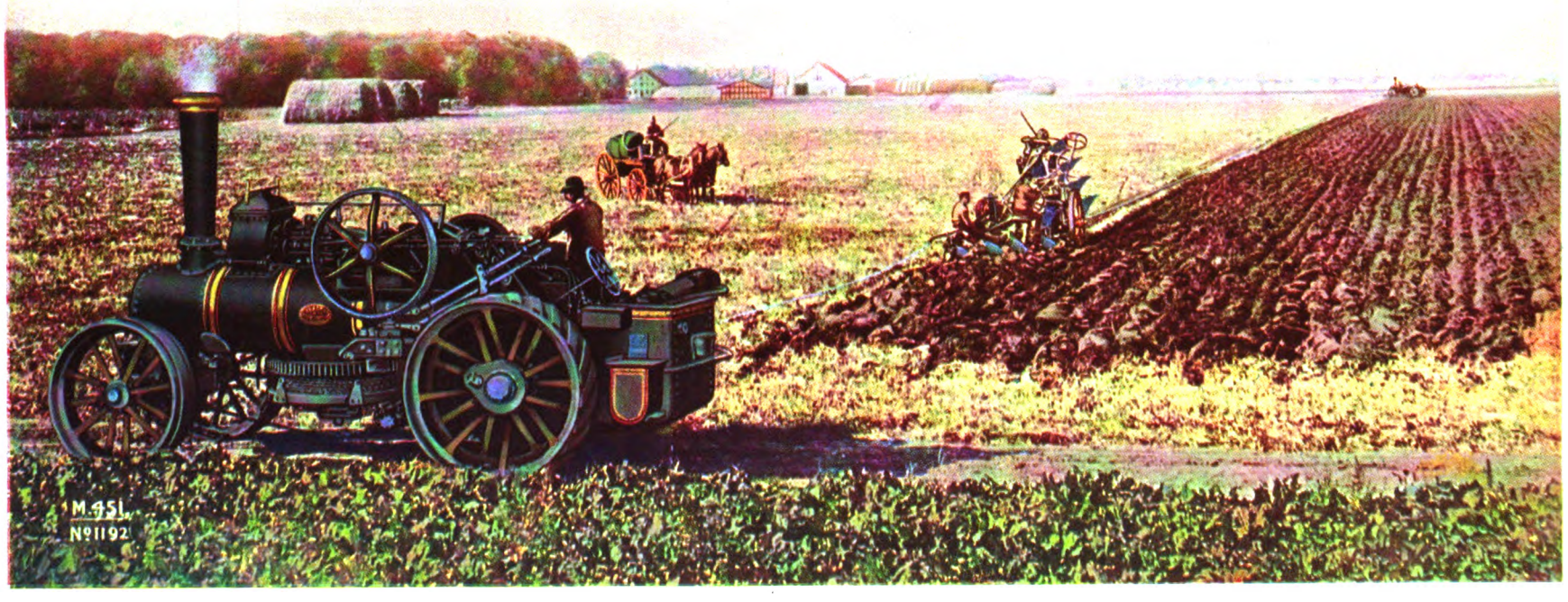
Moreing and Neal.

REFERENCES TO USERS IN EVERY PART OF THE WORLD ON APPLICATION.



Fowler's Double-Engine Cable System of Steam Cultivation.
Tackle at work on a Sugar Beet Estate in Sweden.

Introductory

IN the following pages we illustrate and describe the various plant required in the employment of steam power for the Cultivation of the Soil.

Since the year 1850, when the late John Fowler first invented and introduced machinery which enabled steam power to be used practically and economically for tillage, we have been continually perfecting such machinery, and have now efficiently adapted it to practically all the operations which are required in connection with the cultivation of the soil.

In the space of a Catalogue it is impossible to more than generally indicate the methods to be adopted and the machinery required for Steam Cultivation. Considerable literature has from time to time been published dealing fully with the various branches of the subject, and giving particulars of scientific experiments and of actual working costs and results. We have made it our business to collect all such information, and are therefore able to place it at the disposal of our customers, who should apply to us for it.

The engravings and particulars given herein are subject to alteration without notice, and are not in any way binding.

All former Catalogues and Lists dealing with the same branch of our Manufactures are hereby cancelled.

GOLD CUPS

Presented by His Highness the Khedive of Egypt to the Royal Agricultural Society of England, to be awarded "To the maker of the best implement for the cultivation of the soil by steam power, combining strength with simplicity of construction."

AWARDED TO JOHN FOWLER & CO.

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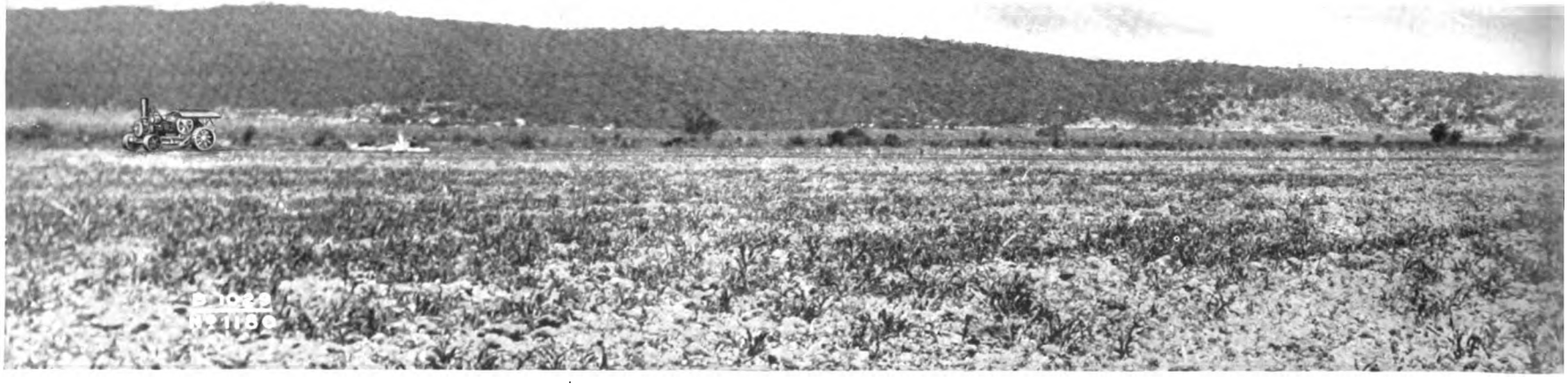
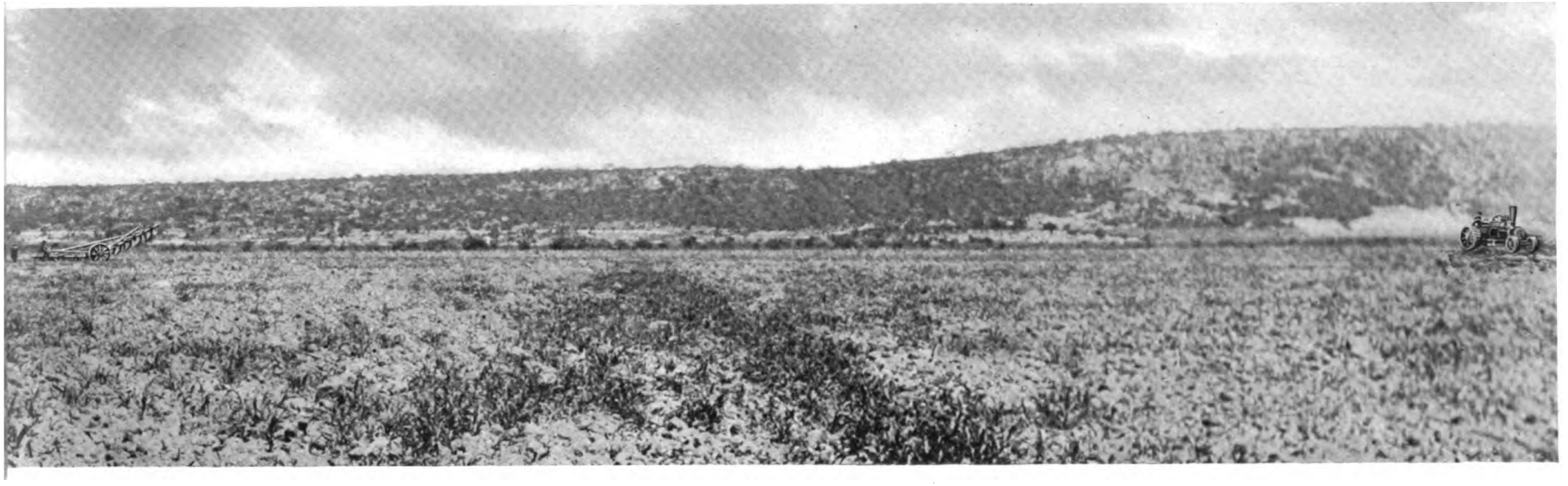
Old Method. Cultivation of the land by animal power in California.



New Method. Fowler's Modern System of Steam Cultivation. Engines working 600 yards apart on a Mexican Estate.



General Information for Intending Purchasers

The continuous and steadily-increasing demand for our Cultivating Machinery from all parts of the world is sufficient proof of the great superiority of steam cultivation over every other system of tillage. Amongst the many advantages of our methods of steam cultivation may be mentioned the following :—

Advantages of Steam Cultivation

By the adoption of steam power the animals used for ploughing operations can be dispensed with, and when the plant is standing no cost of upkeep is being incurred ; the engines used for steam cultivation can also be utilised as traction engines for hauling on ordinary roads (the winding drums being readily removable to reduce the weight), or for driving any machinery to which power can be transmitted by belt. By some of our customers, ploughing engines are preferred to portable engines, for thrashing. Only shallow ploughing can be done with animal power, whereas with cable-drawn implements. work can be done to practically any required depth. It is well known that when land has been under cultivation by animal power for several years the hoof marks form a hard pan under the cultivated land, which both prevents the roots penetrating to the subsoil and the excess of moisture in wet weather from draining away, the land in consequence becoming waterlogged and swampy, and the roots destroyed. The deep loosening of the soil, and the excellent preparation of the surface, by steam

Primitive Ploughing in the Far East.

Advantages of Steam Cultivation (continued)

cultivation, considerably modifies the injurious effects of drought or excessive rain. In deeply-loosened soil the water percolates to the lower layers without interfering with the growth of the crop, and on the contrary, in the case of a long drought, the deeply-ploughed land forms a natural reservoir and stores the water like a sponge for a considerable period after similar land, ploughed shallow by animal power, is deprived of all moisture. The consequent result is that roots of plants grown on steam-ploughed land receive nourishment by capillary attraction, and do well where similar crops on neighbouring animal-ploughed land would make no headway. We have recently had this confirmed in South Africa, where, on the same estate, crops on land ploughed by bullocks failed altogether, whereas on the land ploughed by steam power the plants remained in a healthy condition, being fertilised from the water conserved in the subsoil, and the result was a good average yield. Owing to the speed at which the steam plough travels, the land is well turned over and thoroughly pulverised, and the temperature, aëration, and chemical composition are improved by the effectual opening up of the subsoil to the atmosphere, consequently the roots find no obstacles, freely spread, and take the necessary nutriment, and the plant, whatever it may be, can develop and produce an abundant crop. By the adoption of steam cultivation stubble fields can be broken up after harvest very rapidly: the exposure of soil to the atmosphere immediately after harvest improves its nature and makes it far more productive than land broken up in the late autumn or winter. By steam power a maximum amount of work can be done in a minimum period of time, and this is of considerable importance where the time available for ploughing operations is limited; land also can be reclaimed which otherwise it would be very difficult or even impossible to cultivate.

Native Harrowing in Formosa.

Advantages of Steam Cultivation (continued)

In 1881 we introduced our first set of steam-ploughing tackle into the Sandwich Islands, and the results obtained on the sugar estates there at once confirmed the results obtained in other sugar-growing countries. Prior to their annexation by the United States of America, we had sent out more than 100 sets of double-engine tackle to these Islands alone, and there is scarcely a single plantation not equipped with our Steam-Ploughing Machinery. In spite of the almost prohibitive tariff introduced by the U.S.A. Government since the annexation of the Islands by them, we still receive repeat orders for our double-engine tackles. By judicious deep-steam tillage an enormously increased yield per acre has been obtained there and in all parts of the world.

By careful experiments made in Hungary, on an estate on which our steam-ploughing machinery has been at work since 1872, steam cultivation has been ascertained to give the following increase of crops :—Wheat, 166-lbs. ; Barley, 250-lbs. ; Sugar Beets, 2¾-cwts., per acre.

The cost of steam ploughing has been reduced 50% during the last 25 years. Much of course depends on the quality of the soil, price of fuel and labour, efficiency of management, the power of the tackle, and the number of days in the year it can work, but from many returns most carefully made by our customers, it is proved that our tackle will do many operations that cannot be done by any other means (except possibly by hand labour), and that when doing work that can be done by animals, it will do it considerably cheaper and at the same time much more effectively. A number of these returns giving the actual figures of results obtained over extended periods, under varying conditions and in many different countries, have been printed in book

Native Ploughing in Palestine.

form and can be supplied to intending purchasers. Four men only are necessary for working our double-engine tackle, and with the exception of the labour required for the supply of fuel and water, the rest of the labour is available for the harvest, etc. The larger the area to be ploughed, and the longer the ploughing can be carried on in the year, the cheaper the work can be done. In the cultivation of large areas by other methods the expense of draft animals, the number of labourers required, and the difficulty of lodging and feeding them, are often almost prohibitive.

Methods of Steam Cultivation

The Cultivation of Land by Steam Power can be broadly divided into two classes, viz., that in which the implements are drawn over the land by means of a wire rope, known as "Cable Ploughing," and that in which the engines travel over the land with the implements directly attached, known as "Direct Ploughing." The Cable System is the only method by which the variety of operations required by modern agriculture can be accomplished and of the successful working of this we have now had 60 years' experience. The various ways in which the Cable System is now generally applied are fully described and illustrated in the following pages; we also illustrate and describe on pages 22 and 23 the Direct Ploughing System, as we still supply plant for working by this method. The Direct System has been used from time to time with more or less success during the last 25 years, but although its first cost is smaller it is expensive in fuel and wear and tear; the depth of work is very limited, and only the first operation can be successfully done by it. We therefore only recommend it in special circumstances.

Cocoanut Plantation in the Solomon Islands.

Customers Abroad

The facilities which we possess for dealing with foreign enquiries are of an exceptional nature. Not only have we Branch Houses and extensive stores in various countries on the Continent of Europe, in India and the Colonies, but we have a number of Engineers continually travelling in foreign countries, and we control a large staff of expert ploughmen, who are employed for the purpose of starting Tackles for new customers. This gives us every facility for obtaining such information as enables us to design our Engines and Implements to suit all possible agricultural conditions in every part of the world.

It has been our experience that natives, after having been under the control of one of our expert ploughmen, often prove themselves to be quite capable of working our Tackle satisfactorily.

As will be seen from the foregoing, our arrangements are such that we can give experts' advice free in most parts of the world, but to avoid loss of time, correspondents should, with their enquiries, send us the following particulars :—

1. The nature of the soil—whether sandy, marshy, loamy, clayey, etc.
2. Whether the land is free from roots, stones, etc.
3. The formation of the land, viz., whether flat or hilly.
4. The kind of crops intended to be grown.
5. Whether the land has been under previous cultivation or is virgin soil; in the former case the kind of crops which have been grown should be stated.
6. The extent of land to be operated upon per annum.
7. The duration of the wet and dry seasons.
8. The kind and quality of the fuel available, whether coal, wood, oil, straw, megass, cotton stalks, or other inferior refuse.

The above particulars, supplemented by the reports of our outdoor staff, will enable us to send quotations and details of the plant which will be most suitable.

Classification of Engines

For many years we have discarded the use of the term "Nominal Horse Power," commonly used as a guide to the power of engines, as misleading and inaccurate. The method of arriving at it varies in different countries, and even with different makers in England. American Nominal Horse Power is often double or treble the British for the same size of engine. But in an engine for ploughing on the Cable System, many other conditions beside power are essential for the successful working. We therefore classify for the purpose of a catalogue our different sizes under Class letters, and when in possession of the information as to land mentioned in the preceding paragraph, we will then supply full details of the most suitable Engines and Implements.

Design

From the year 1850 to the year 1864 we made all our Cable Ploughing Engines with double cylinders, but in consequence of the necessarily short stroke, the high boiler pressure required, and the objections from a practical point of view to a very early cut-off, this type was found uneconomical in fuel. Single-Cylinder Engines were then introduced, and they proved themselves more economical for cable ploughing than Double-Cylinder Engines, but they were somewhat more difficult to handle. In 1880 we introduced our present system of side-by-side compound cylinders, entirely jacketed by boiler steam, so arranged that the cylinders practically work in the boiler. This system was found 30% more economical than the single cylinder, and also enables the Engine to be started more easily than was the case with Double-Cylinder Engines having an early cut-off. Compound cylinders working on to a single crank were afterwards used by other makers, but these, although they enabled the steam to be used expansively, were not efficiently steam jacketed, and in consequence of one of the cylinders being fixed at a great height above the boiler, put large additional strains on the boiler and joints; they were also rather worse to handle and start than single-cylinder engines.

To secure the efficient and economical working of a Steam Ploughing Plant, it is essential that the details of the Engines and Implements be so designed as to be interdependent and to suit the conditions under which the

Design (continued)

plant has to work, and in each class of Engine it is essential for success to vary many details to suit different conditions of soil, climate, and labour available. The design of our Engines and Implements has been perfected after many years of practical experience; they are specially made to give the greatest possible economy and to withstand the maximum strains with a minimum of weight and size. All our Ploughing Engines are specially constructed to give the most efficient results and the maximum power for ploughing; when desired for other purposes, information concerning the power they will give off continuously by belt will be supplied on application.

Types of Cylinders

We manufacture two types of Compound Cylinders. The one type is that in which the cylinders and steam chests are entirely steam jacketed, being surrounded by boiler steam; this, while preventing priming and ensuring a supply of dry steam to the cylinders under all conditions, necessitates a cover for the two steam chests which of course cannot be removed for examination of the valves while the boiler is under steam. The other type is that in which, though the cylinders are entirely steam jacketed, the valve chests are not; in this arrangement the valves can be examined while the engine is under steam. There is no doubt of the superior economy in coal and water of the former type, and the entire absence of condensation enables the engine to give off its maximum power; but as a demand is sometimes made for the latter, we make the application of either type optional with our customers.

Tests

We have a complete and up-to-date testing plant, and all Engines before leaving our works are subjected to most severe tests as regards the Indicated Horse Power and also the Brake Horse Power given off at the crankshaft and periphery of the road wheels respectively. The testing plant is so arranged that the engines can be run, and Indicator Diagrams taken at speeds up to 400 revolutions per minute. We also have at our disposal large tracks of agricultural land for testing purposes, and any modifications in the design of engines and implements are thoroughly tested under practical working conditions.

Duplicate Parts

All details and working parts are produced on the duplicate and interchangeable system by gauges, templets, etc., enabling correctly-fitting duplicates to be supplied promptly. While duplicate parts are obtainable at short

notice from stores specially provided at various places on the Continent and in the Colonies, we recommend that in order to save time an assortment of spares be sent with all engines and implements for export. A Catalogue of Duplicate Parts, giving code numbers for all items, is supplied to users of our Tackle.

Awards

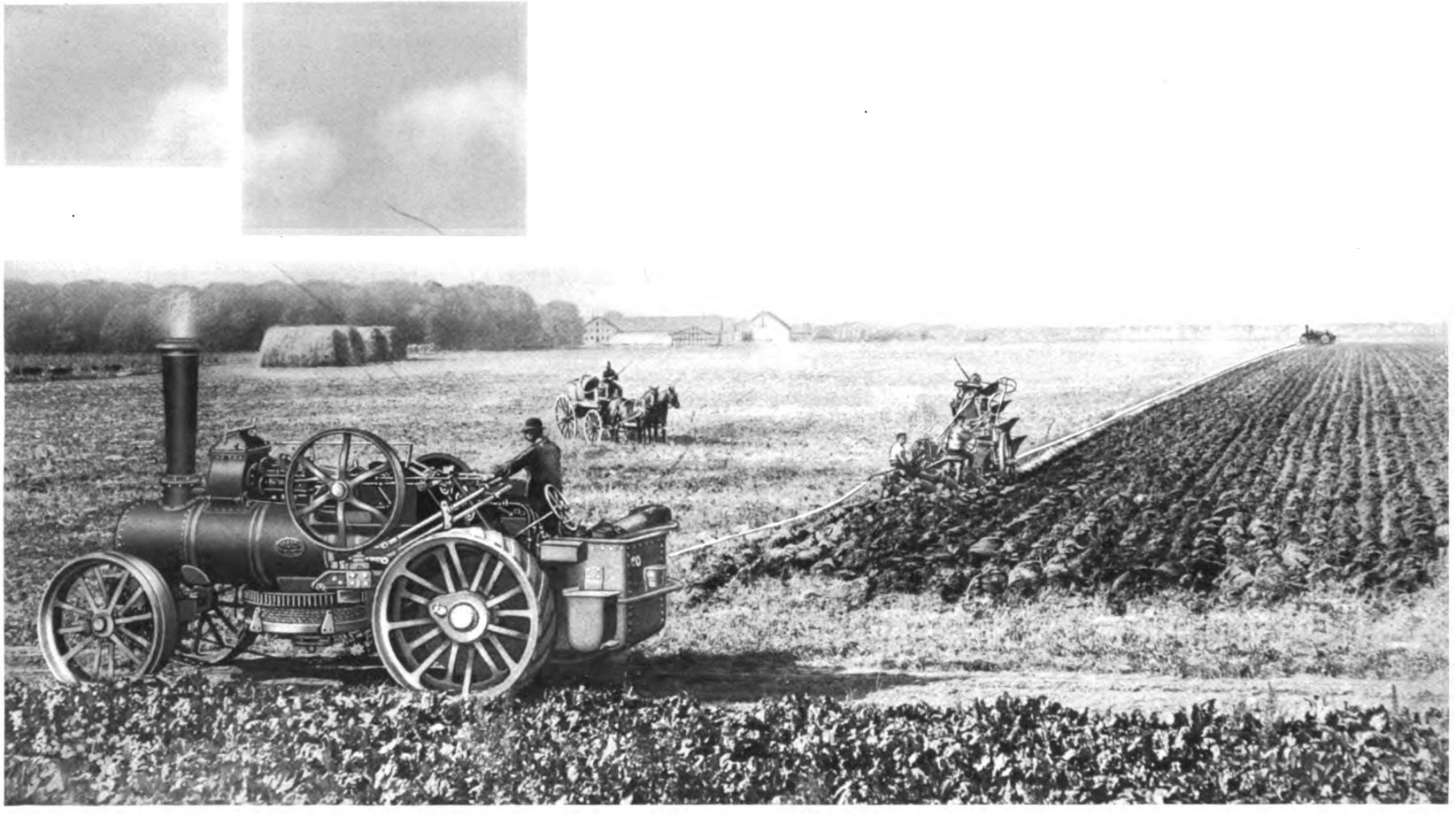
On pages 116 to 120 will be found a list of some of the more important awards secured by us since the year 1857. Between the years 1860 and 1880 a large number of prizes were awarded by the Agricultural Societies for Steam Ploughing Machinery, and, to the best of our knowledge, all of these were secured by us. The Royal Agricultural Society of England in particular offered a variety of prizes for Steam Ploughing Machinery for public competition, all of which we secured. Since the year 1880 the Royal Agricultural Society of England has only awarded Silver Medals for new inventions possessing exceptional merit. Two of these medals have been given for Steam Ploughing Machinery such as we manufacture, both of which were awarded to us; one in 1887 for a Plough fitted with our Patent Anti-Balance Gear and the other in 1894 for our Turn-round Plough. Since the advent of Steam Cultivating Machinery we have always been first and foremost in introducing improvements, which is shown by the awards we have obtained from time to time, and the extent of our business.

Patents

Since we introduced Steam Cultivating Machinery, all improvements in detail effected, and most of the new implements designed, have been protected under the Patent Laws of this and other Countries, involving many hundreds of Patents covering all classes of Engines and Implements. In one of our modern sets of Tackle upwards of 20 current Patents are embodied, each of which essentially contributes to the successful working of the plant. Though in the course of time many of our older Patents have expired and have been copied by imitators, yet at the present time we hold more Patents than have ever been held in the history of the firm, covering practically every important detail of our modern Steam Cultivating Machinery.

Testimonials

Pamphlets containing selections from the large number of testimonials we are constantly receiving will be supplied on application.

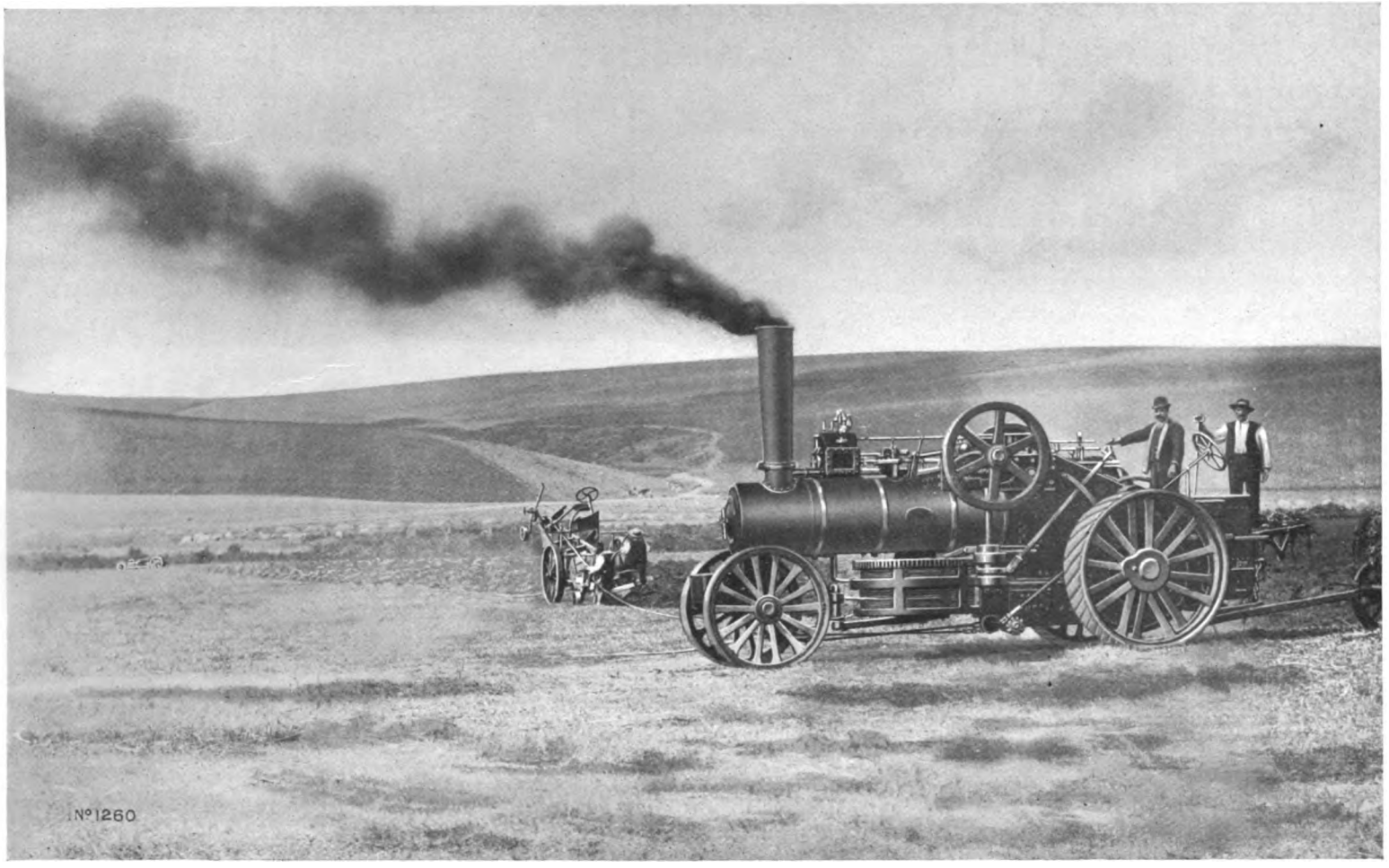


Fowler's Double-Engine Cable System of Steam Cultivation.
Tackle at work on a Sugar Beet Estate in Sweden.

Fowler's Double-Engine Cable System of Steam Cultivation

The experience gained by 60 years of practical work with several thousand sets of Tackle in all parts of the world has continuously proved that to perform the many different operations and do the great variety of work required by agricultural science, the best and most successful method is to haul the implements required for the work by specially prepared wire cables to and fro across the land by means of suitably constructed engines fitted with winding gear; at the same time these engines move themselves forward across the sides or ends of the land to be operated upon, and when the work is finished move themselves and all their implements to new work, possibly many miles away, without the assistance of extra men or animals.

The engines should be placed, if possible, 400 to 450 yards (360 to 400 metres) apart if the contour of the land and size of fields will permit. They can be placed at less distance, but if so placed less work can be done per hour in consequence of the increased time occupied in reversing the implements. By the latest improvements we can now supply Tackle with drums and gear constructed to permit of the engines being placed 600 yards (550 metres) apart, and in some cases (provided the land is suitable) 800 yards (730 metres). Several thousand sets of our Ploughing Tackle on this system are at work in Great Britain, Germany, France, Italy, Spain, Portugal, Russia, Poland, Austria-Hungary, Roumania, Egypt, Algeria, South Africa, Portuguese West Africa, Portuguese East Africa, German East Africa, Asia Minor, Formosa. Philippine Islands, India, Australia, New Zealand, Fiji Islands, North and South America, the East and West Indies, the Hawaiian Islands, etc., etc., in fact in almost every part of the world in which the soil is cultivated by any but the most primitive means.



Fowler's Single-Engine Cable System of Steam Cultivation at work on a Hungarian Estate.

Fowler's Single-Engine Cable System of Steam Cultivation

With Double-Acting Implements

The first cost of this system is less than that of the Double-Engine System already described, and it has proved very successful on small Farms and Holdings where the quantity of work to be done is not so large. The method of working is as follows :—

A specially-constructed Engine travels forward across one side or end of the land to be operated upon, and, besides hauling the implement across the field by means of its rope, it also moves forward a specially-constructed Automatic Anchor on the opposite side or end, which anchor takes the place of the second engine in the Double-Engine System. The Engine employed in this system is fitted with two winding drums and lengths of rope ; with one of these the implement is hauled from the anchor to the engine, and with the other it is hauled back to the anchor, the latter rope passing through a snatch block which is placed in advance of the engine on the opposite side of the field.

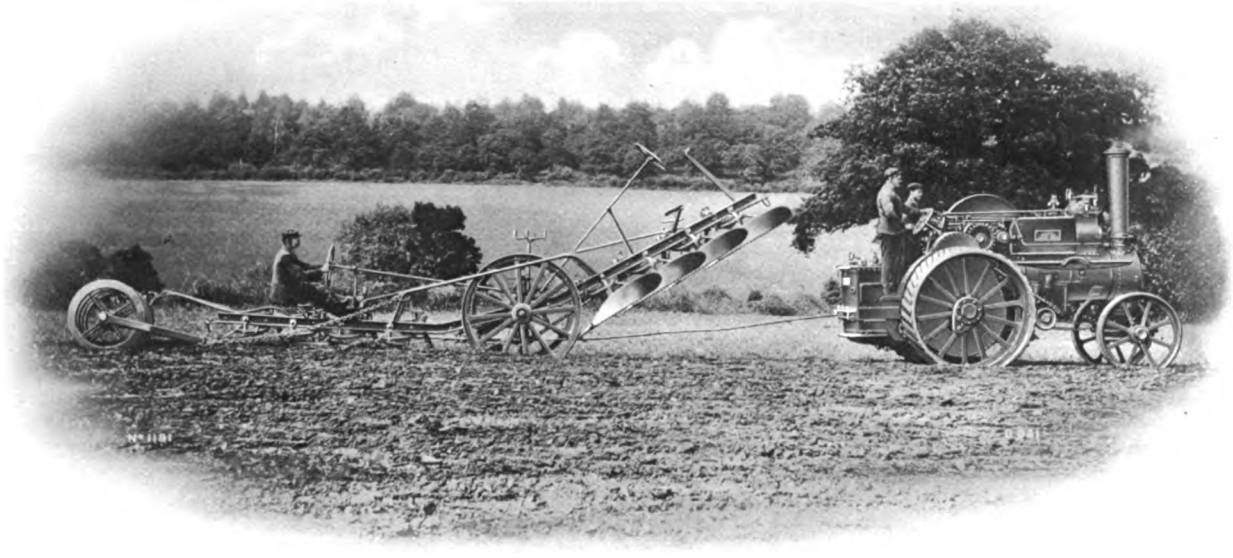
This Single-Engine System has the great advantage that at any time the anchor can be replaced by the purchase of another engine, and thus the system is converted into the Double-Engine System, as it were by instalments. If two neighbouring Farmers each purchase an engine suitable for the Single-Engine System, they can each of them do their own work on the latter system and combine and work for hire on the Double-Engine System.

The quantity of work that can be done per day on the Single-Engine System is considerably less than can be done on the Double-Engine System, as time is occupied in setting the tackle to work, and the area of the ground that can be operated upon at one setting is limited.

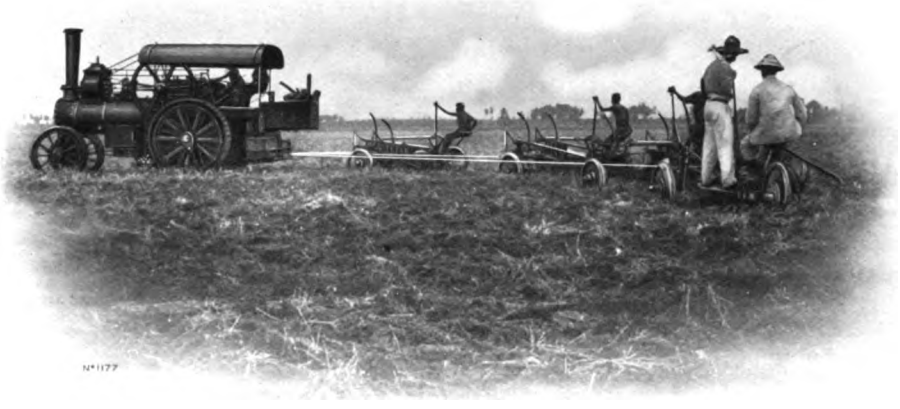
With Single-Acting Implements

For very small areas we have introduced a modification of the Single-Engine System, by which the implements are made single-acting (see page 63), and are drawn to the side or end of the field opposite the engine by means of a very light and inexpensive " tail " rope. This tail rope is taken round the field in a similar manner to that employed in the Single-Engine System with double-acting Implements, but instead of the anchor an ordinary snatch block is used, which is moved by hand along a chain, anchored on the opposite side of the field to the engine. Work up to 24-in. deep is done in the South of France by this class of Tackle with very successful results.

Fowler's Direct-Traction System of Steam Cultivation



In this system the ploughs and other implements are drawn across the land coupled direct to the engine, as shown in the above illustration. The engines used are of similar construction to those which we manufacture for hauling and thrashing purposes, but are fitted with special draw gear at both the front and rear of the engine, which does not turn at the headlands but hauls the plough from the front draw gear, the engine running backwards. The ploughs are so made as to reverse at the headlands, so that all furrows lie in one direction and no time is lost in turning. This method of working also greatly facilitates the supply of fuel and water to the engines, as it is not necessary for the water carts to cross the ploughed land.



Direct Traction Ploughing with a Fowler Engine in the Solomon Islands.

The illustrations on this page show one of our Special Traction Engines drawing Four Gang Disc Ploughs.

In this method of ploughing it is usual to plough round and round the land, turning at the ends, as shown.

General Specification of Standard Ploughing Engines

For the Double and Single-Engine Systems

Boiler Constructed of the best Siemens-Martin Steel Plates carefully annealed; the plates planed on their edges and flanged by hydraulic pressure. All holes, where possible, are drilled in position after the boiler is plated together. The riveting is done by hydraulic pressure. The design and construction will pass the tests of the Manchester Steam Users' Association or other leading Insurance Companies for a working pressure of 180-lbs. per square inch (13 Atmospheres), and are equal in strength and workmanship to the best locomotive practice.

Boiler Fittings All the usual steam fittings and mountings of the most substantial and approved design are supplied. A manhole in the boiler barrel facilitates internal examination and cleaning, and accessible mudholes are arranged at the bottom corners of the firebox shell, so that a rigid cleaning rod can be inserted for the full length of the water space on all four sides.

Boiler Feed The boiler is fed by a Feed Pump and an Injector delivering through independent clackboxes, which are stoppered to allow of examination under pressure.

Special Fuels For burning wood, oil, straw, or inferior fuel of any kind, the firebox can be made suitable at an extra charge. (See Straw-Burning Engines, page 33).

Water Tank and Fuel Bunker Tank, ashpan, gear covers, etc., are flanged by special machinery, with corners of large radii, easily accessible for cleaning; accumulations of dirt and consequent corrosion are thus avoided.

Gearing and Shafts The ploughing and road gearing is cast of a special mixture of steel to an analysis which experience has proved the most durable. Two travelling speeds are provided, the fast speed for travelling on roads and hard land, the

Gearing and Shafts (continued)	slow speed for soft and uneven ground. The ploughing gear has one speed only on standard engines, but when required, our Patent Double-Speed Ploughing Gear can be fitted at an extra charge; for full description of this gear see page 32. The shafts and axles are forged from selected hammered steel ingots.
Upright Shaft	Of special gun steel, carried at the bottom end in a footstep bearing securely fixed to both firebox shell and boiler. This arrangement has been found the most satisfactory for the proper distribution of the strains.
Winding Drum	Of best cast steel carried on a stud bolted to a special mounting on the boiler barrel. 450 yards of steel cable are carried on our standard drums, but drums carrying up to from 700 to 800 yards can be supplied if required.
Winding Drum Stud	Of special material, case hardened, so proportioned as to withstand, with a large margin of safety, any strains to which it can be subjected, without the use of any bottom stay, which has been proved to be detrimental.
Coiling Gear	Of improved design, fitted to the winding drum, automatically coils the rope evenly upon the drum. This gear is not fitted to engines having vertical winding drums (see page 38).
Road Wheels	Of steel and wrought iron. The hind wheels vary in width and diameter according to the class of work and the nature of the ground to be travelled over, but on all engines they are of such diameters as to keep the engine as high off the ground as is advisable, with due regard to the alignment of the winding drum with the implements.
Cylinders	Of cold, blast iron, thoroughly steam jacketed, provided with all usual fittings, such as regulator valve and drain cocks (worked from the footplate), lubricator, etc., all of high-class finish and substantial design. A special self-closing starting valve, also operated from the footplate, is supplied with Compound Engines, which prevents any necessity for reversing when starting.
Pistons	Of wrought steel, fitted with patent rings and springs.
Crossheads	Of wrought steel, fitted with adjustable slippers and bearings to carry connecting rod pins.
Connecting Rods	Of best hammered scrap iron, turned and polished, and fitted with adjustable gun-metal bearings at the crank end, and with fork and case-hardened pin to work in adjustable bearing in crosshead.

Valve Gear	The link motion and reversing gear are made of special steel or best Yorkshire iron, and are of approved type. The joints and wearing surfaces are extra large, and are deeply case hardened.
Flywheel	Of best cast iron, turned on rim to correct radius for belt driving.
Crankshaft	For Single-Cylinder Engines this is forged and bent out of a solid hammered steel shaft, the balance weight being cast on the rim of the flywheel.
	For Compound Engines it is made from a solid steel forging, the webs being cut out of the solid in the lathe, in the same manner as are locomotive crank axles, the balance weights being securely fixed to the webs.
Lagging.	The boiler barrel and cylinders are covered with wood and neatly finished with sheet steel lagging secured by brass bands.
Various Fittings	Efficient worm steerage of malleable or wrought iron, suitable clutch gear for ploughing and road motions, all usual fittings and mountings, and complete outfit consisting of waterproof cover, toolboxes, spanners, box keys, hand hammers, chisels, screw wrench, pincers, splicing spike and tongs, gauge glasses and washers, fusible plugs, files, tube brushes, caulking tools, stoking tools, spuds, slings, splitpins, bolts and nuts, head lights, instruction books, tallow kettle, funnel, oil cans and feeders, and a supply of oils, tallow, spun yarn and cotton waste.
Lubrication	Special attention has been paid to the arrangements for the efficient lubrication of all working parts, and particularly such bearings as are not easily accessible when the engine is in motion.
Driving and Steering	The starting and reversing levers, clutch gears, feed pump, and steerage wheel are all easily accessible from the footplate so that one man only is required on each engine when ploughing.
Extras	Firebox for special fuels, bunker for special fuels, extra large winding drums, extra long ropes, extra wide wheels or widening rings, " drop " or " rocking " fire grate, double-speed ploughing gear, short or long awning, water-lifter with suction hose, spark arresting chimney, wash-out force pump with hose, duplicate parts for export, packing for shipment, etc. We also fit superheaters to any of our engines if required.

Steel Ploughing Cables

The steel wire cables used in our system of steam cultivation are a most important item. It is necessary that they should be able to stand enormous strains without breaking, to be very hard, so as to withstand the wear from friction on the ground and also to be sufficiently pliable to coil readily on the winding drums. For some years after we introduced our system of steam cultivation, we bought the highest quality ropes, made of the most suitable wire procurable from the best wire rope makers; but we found that it was impossible to obtain consistently reliable ropes, which would work satisfactorily under the special conditions and strains to which they are subjected in steam cultivation. In fairness to the manufacturers of steel wire cables, however, it must be borne in mind that cables for steam cultivation require to essentially differ from those used for other purposes and that a cable which is entirely unsuitable for steam ploughing, may be eminently suited for work of a different description. In consideration of the above we laid down special machinery for the manufacture of these cables and since then we have been able to turn out regularly ropes which have proved themselves to be absolutely reliable. Every wire used in the manufacture of our ropes undergoes special and severe tests before being used. Unsuitable and inferior ropes are fatal to the success of a Tackle, not so much from the cost of renewing the ropes themselves as on account of the delays caused by splicing and the consequent reduction of work done.

We now manufacture all our ropes on the system of construction known as " Lang's " unless we receive special instructions to the contrary. The illustrations below show the advantage derived from this method of construction.

Ordinary or Old Construction.

WHEN NEW.

WHEN WORN.

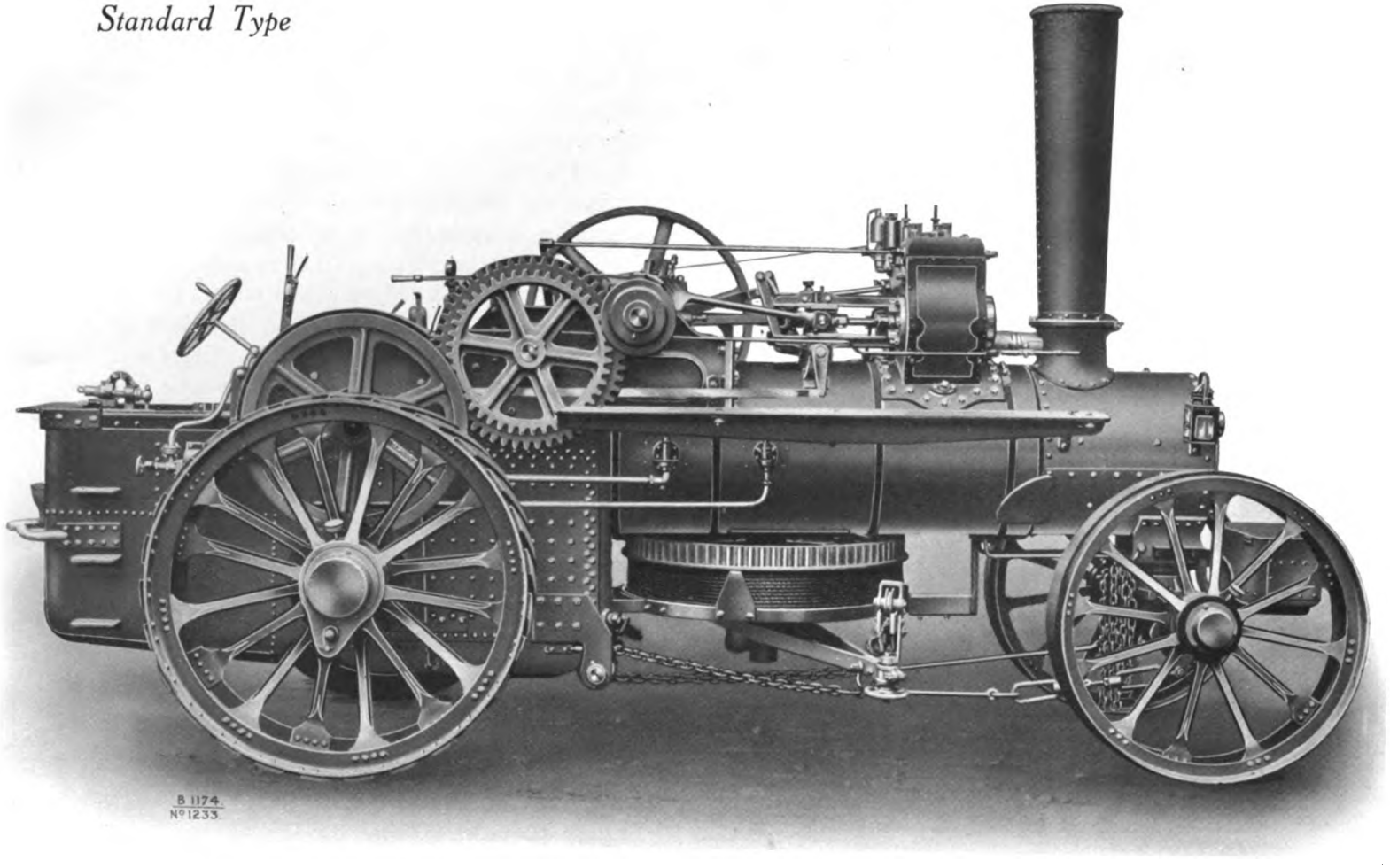
Lang's System of Construction.

WHEN NEW.

WHEN WORN, SHOWING THE LONGER WEARING SURFACE ON THE CROWN OF THE WIRE.

Improved Compound Self-Moving Ploughing Engine

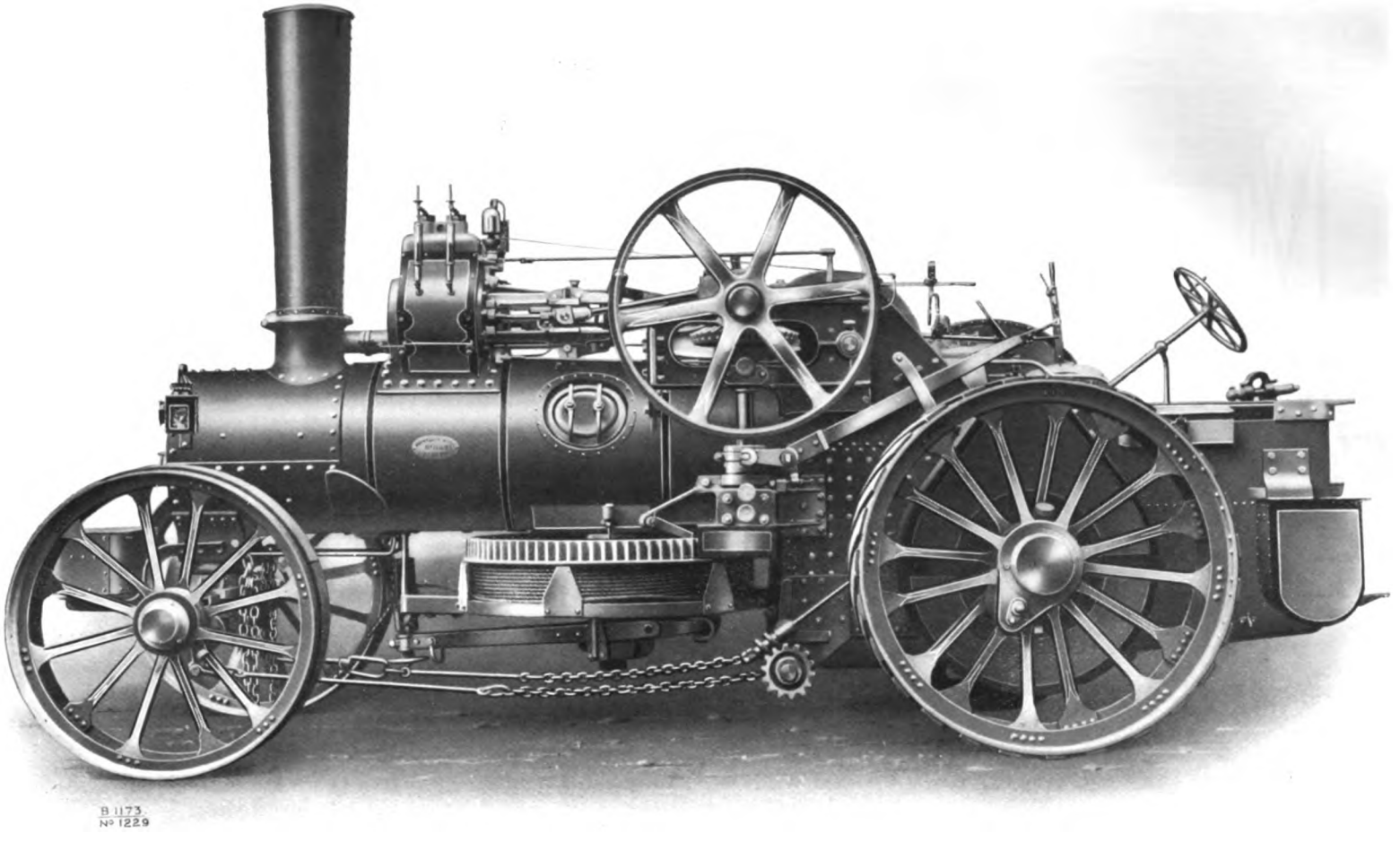
Standard Type



Road-Gear Side.

For Specification, see pages 24 to 27.

The Engine illustrated above and on the opposite page represents our Standard Type of Compound Ploughing Engine for use with the Double-Engine System, which is illustrated and described on pages 18 and 19.

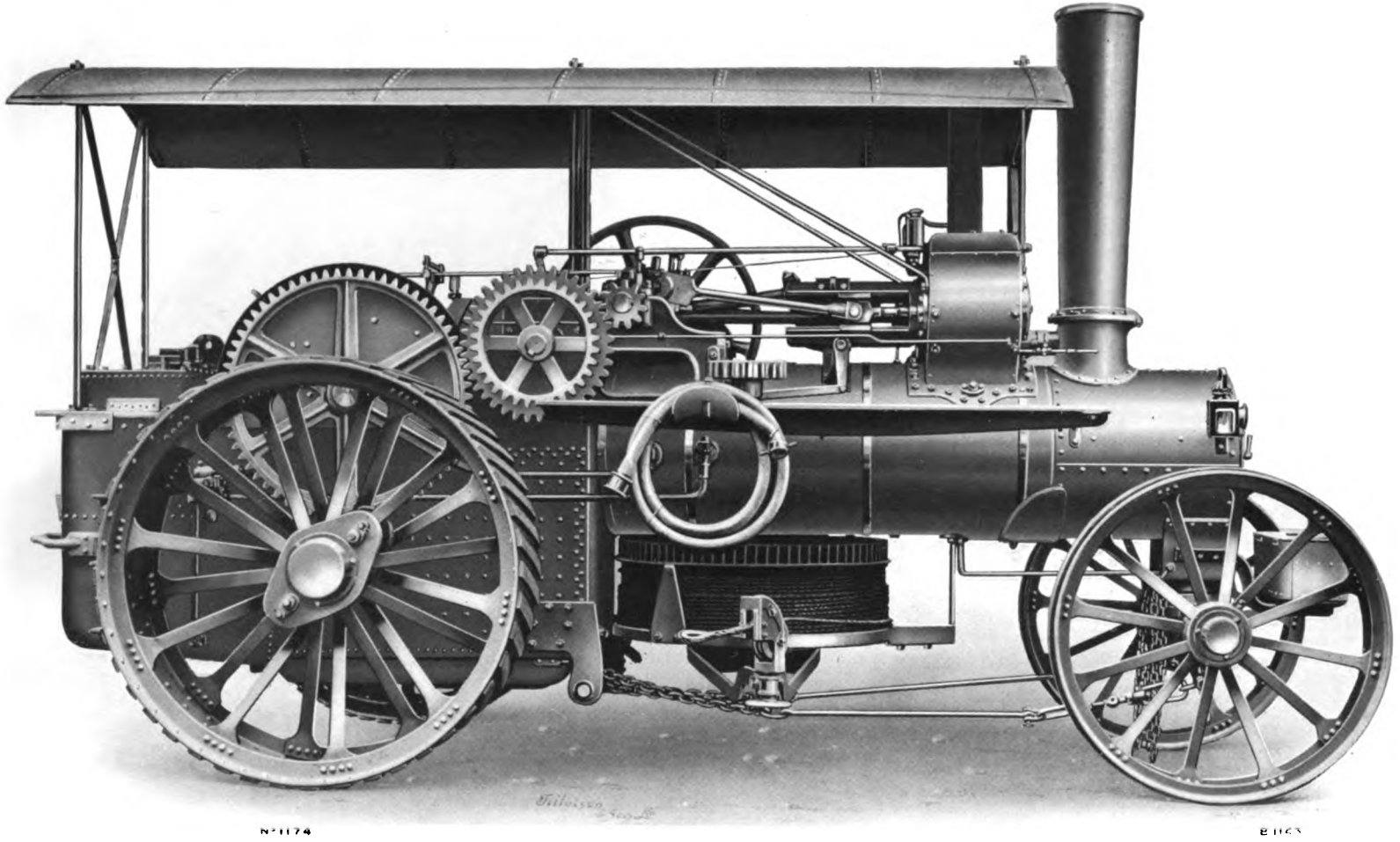


Flywheel Side

We manufacture this Type of Engine in nine sizes, viz., Classes D, K, KK, B, AA, ZA, Z, DD, and EE, indicating respectively from 60 to 300 horse-power when ploughing.

Improved Compound Self-Moving Ploughing Engine

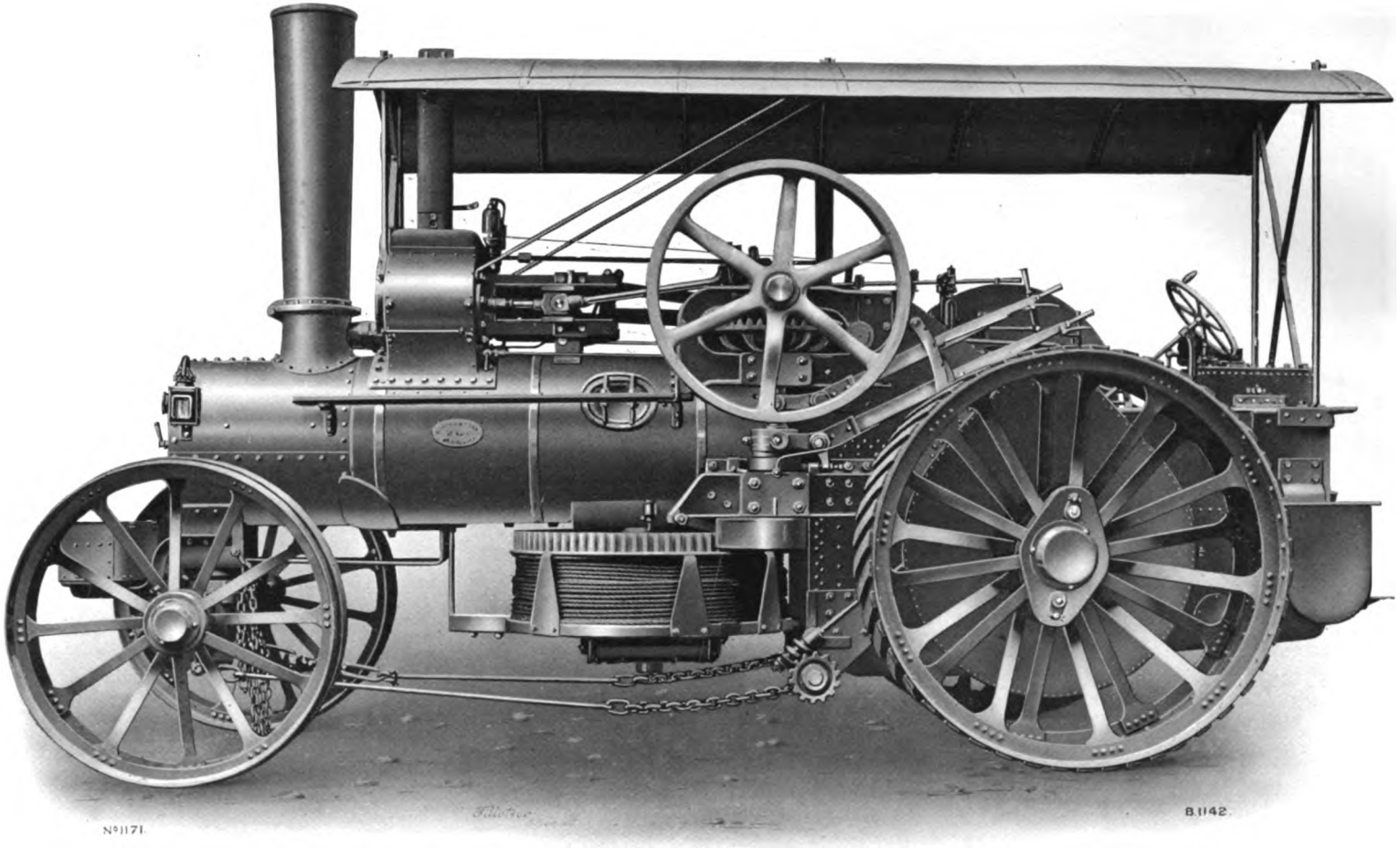
Special Type



Road-Gear Side.

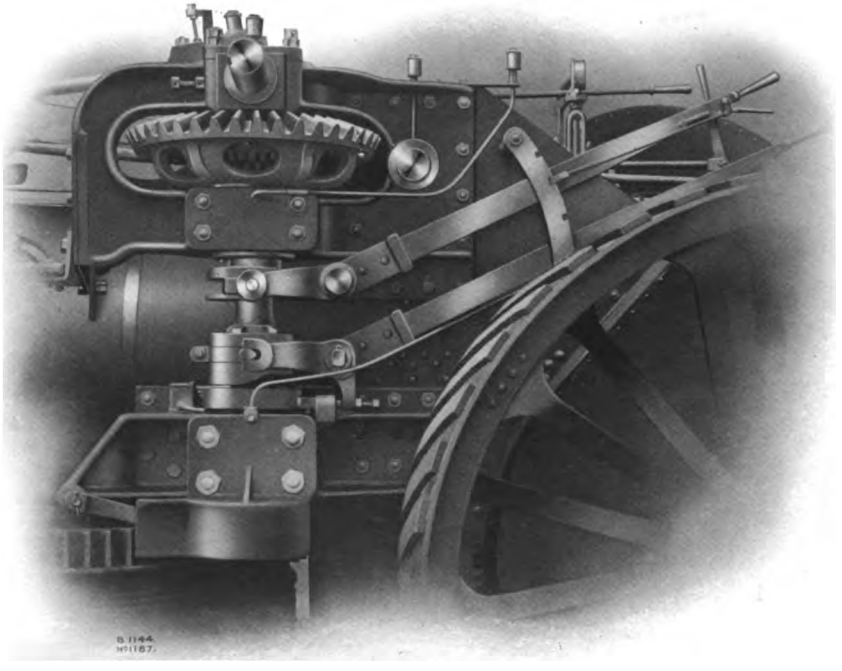
For specification, see pages 24 to 27.

The engine illustrated above and on the opposite page is one of our Compound type for working on the Double-Engine System, as shown on pages 18–19. It is fitted with some of the extras shown in the specification, viz.,



Flywheel Side.

Double-Speed Ploughing Gear, Oil Burning Apparatus (both described on the page following), Awning extending over the whole engine, Water-lifter with 26-ft. of suction hose, and funnel to carry steam from safety valves through awning.



Fowler's Patent Double-Speed Ploughing Gear

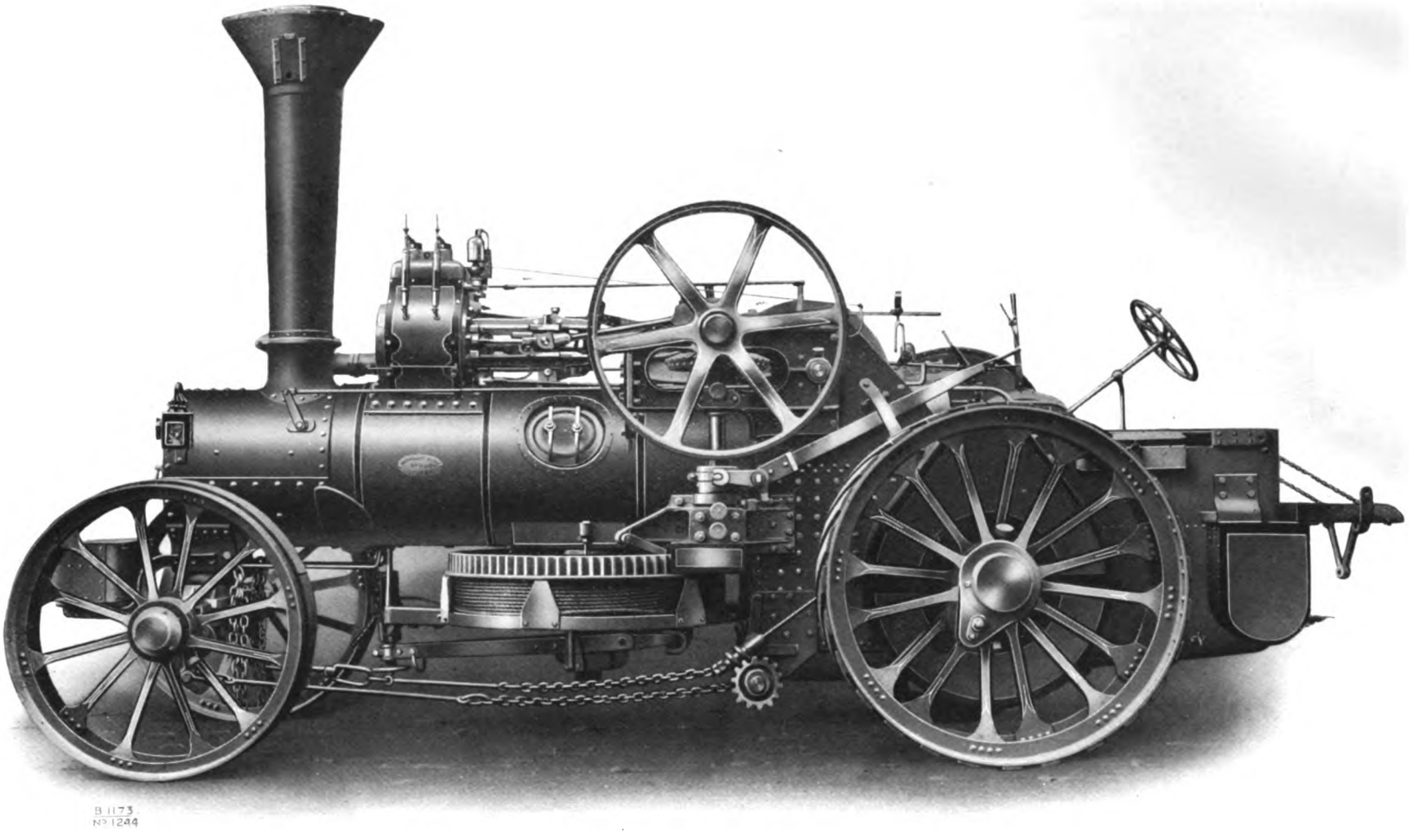
As will be seen from the illustration here given, this gear is arranged to work through one upright shaft only. The shaft is continuous and is carried in top and bottom bearings. By this arrangement the complications and the additional friction occasioned by the use of two shafts and clutches is done away with.

Oil-Burning Apparatus

This consists of a special type of spray injector, firebrick arch in firebox, fuel supply tank in bunker and all necessary connections. We have fitted this apparatus on a large number of engines for use in countries where oil is the most suitable fuel available, the results in all cases being most satisfactory. Almost any kind of combustible liquid can be used with this apparatus, viz., Petroleum (crude or refined), Astatki (Russian Naphtha Refuse), Green Oil, Creosote Oil, Shale Oil, Blast Furnace Oil, and Coal or Oil Gas Tar.

Improved Compound Self-Moving Ploughing Engine

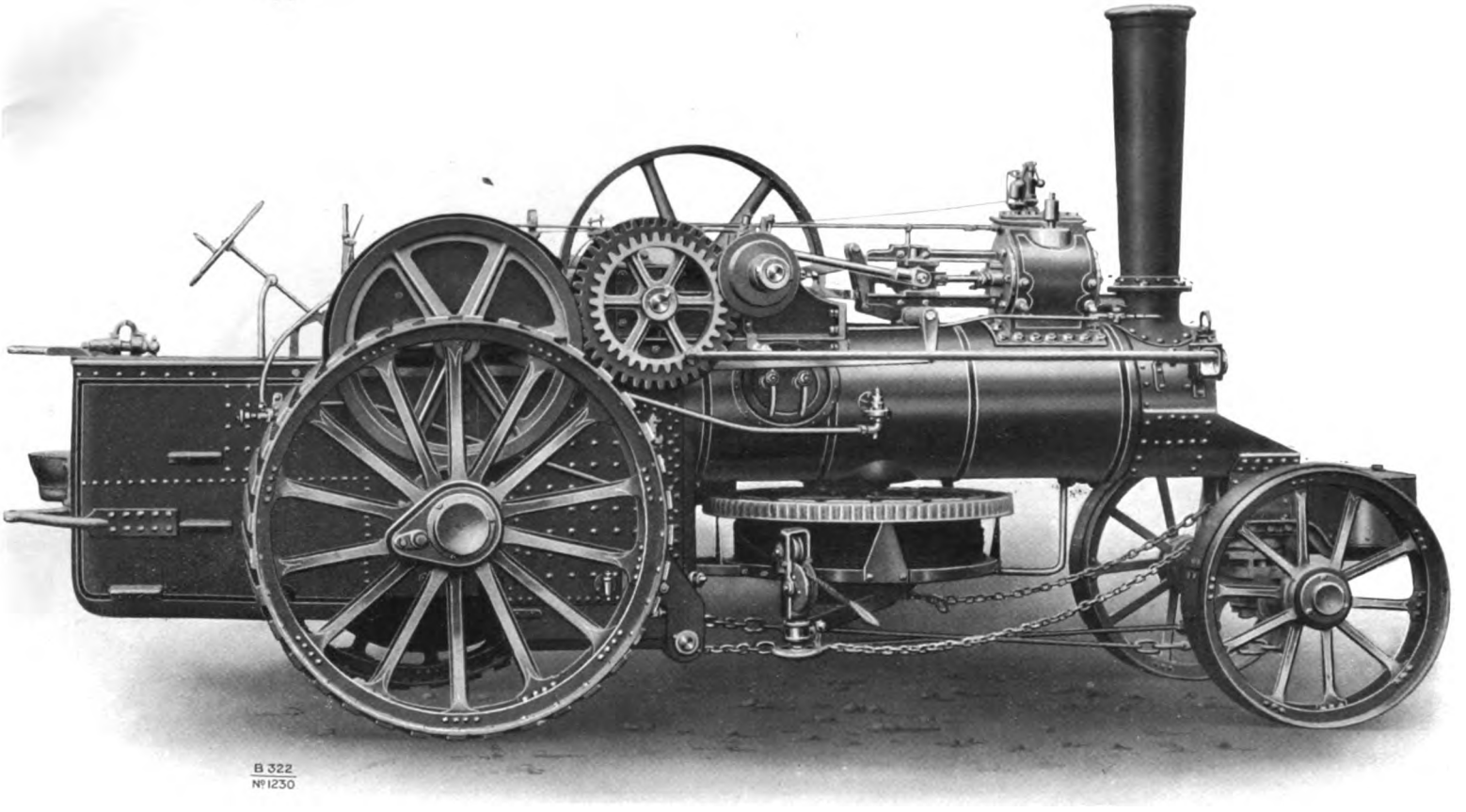
Fitted with Improved Strawburning Apparatus



The illustration above shows one of our Standard Engines fitted with our improved arrangements for straw burning, consisting of a special firebox having suitable grate, deflector and firehole door, let-down type of tank, and an improved type of spark-arresting chimney which is worked from the footplate.

Improved Single-Cylinder Self-Moving Ploughing Engine

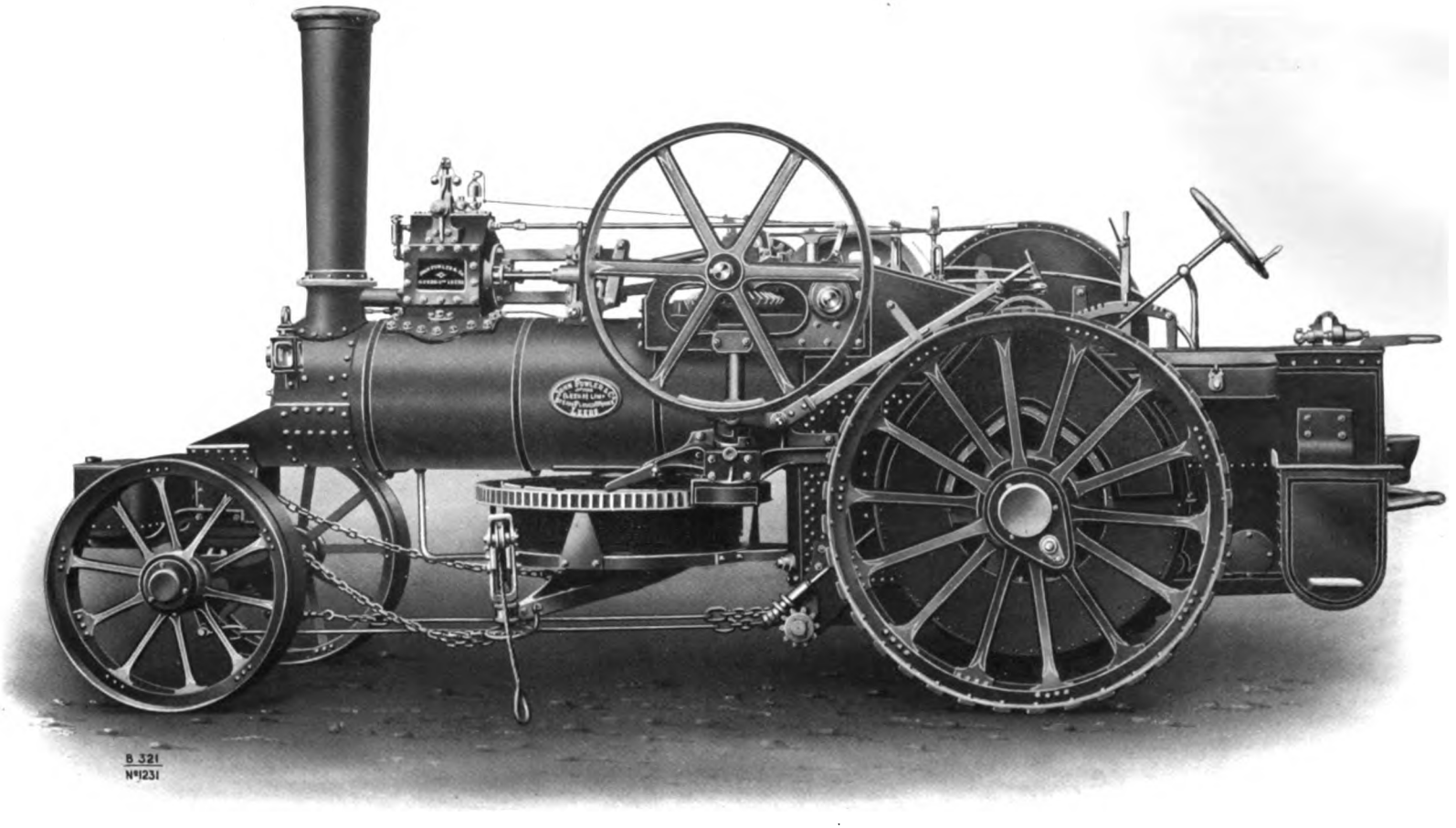
Standard Type



Road-Gear Side.

For Specification, see page 24 to 27.

The Type of Engine illustrated above, and on the opposite page, is similar to the Types shown on the preceding pages with the exception of being fitted with a Single Cylinder instead of Compound; it is also for use with the Double-Engine System.



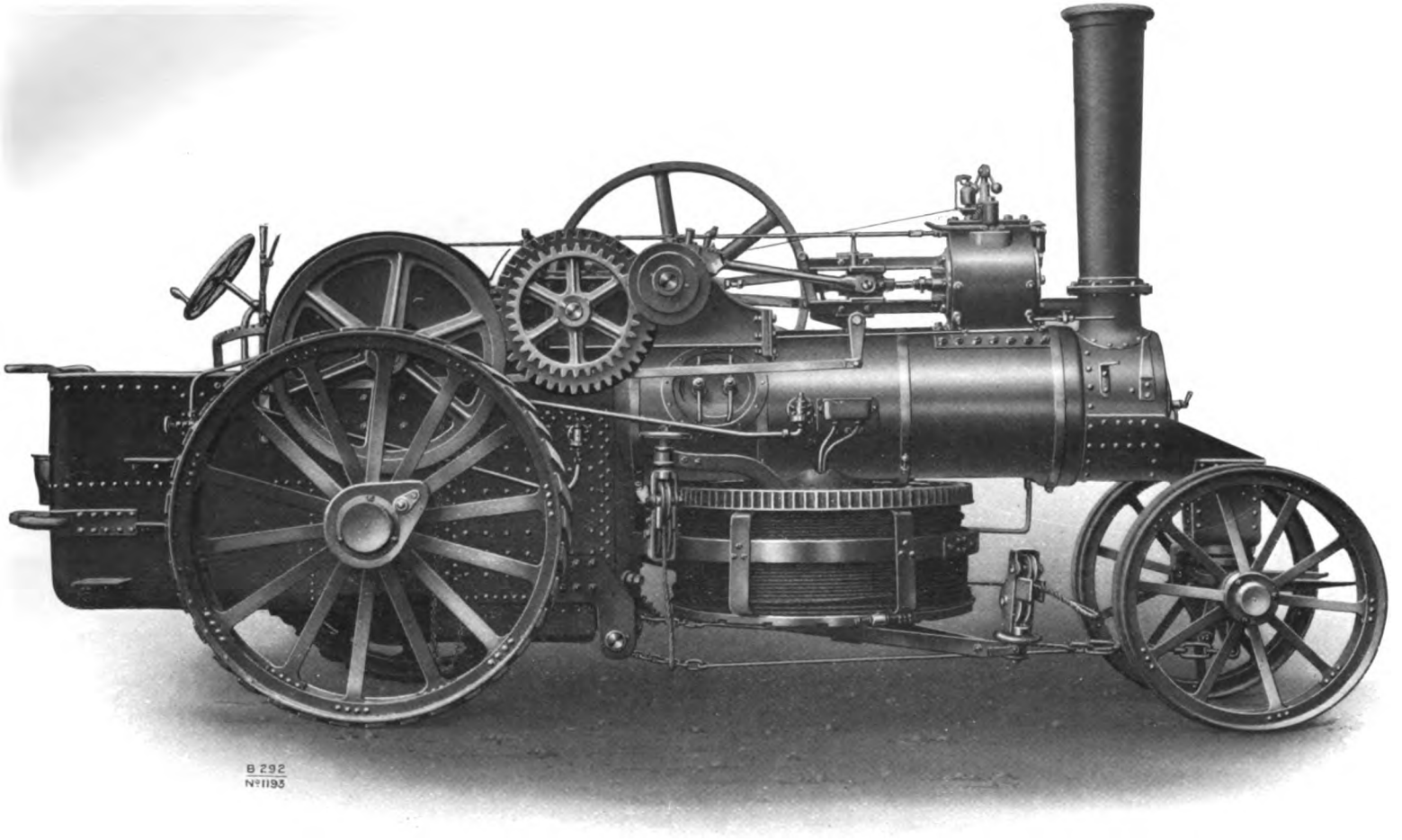
Flywheel Side.

The smaller sizes only of Ploughing Engines are now made with Single Cylinders, and then only where fuel is cheap and water easily obtainable.

We manufacture four sizes of this type, viz., Classes D, K, KK, and B, indicating respectively from 60 to 100 horse-power, when ploughing.

Improved Single-Cylinder Self-Moving Ploughing Engine

Standard Double-Drum Type

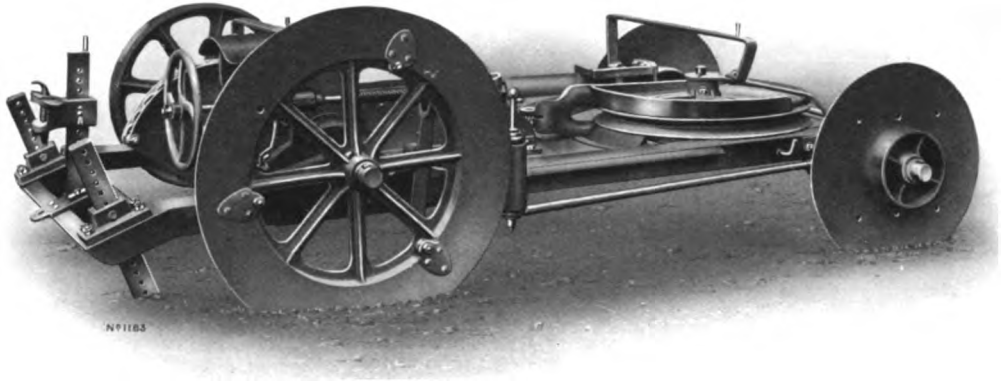


For Specification, see pages 24–27.

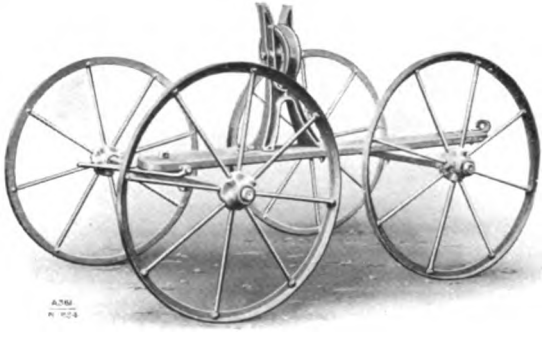
This type is used in connection with the Single-Engine Cable System with the automatic anchor described and illustrated on the opposite page. As will be seen from the description of the system on page 21, it is so arranged that it can also be used for the Double-Engine Cable System.

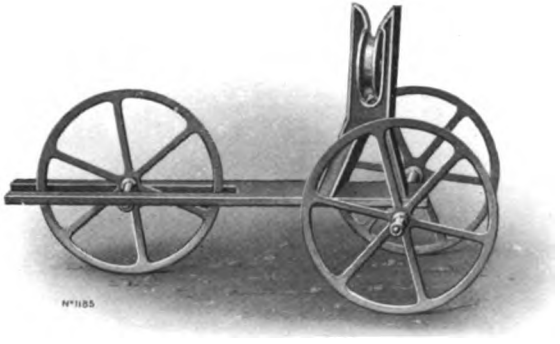
The illustrations on this page show our Patent Automatic Anchor and three and four-wheeled Rope Porters for use on the Single-Engine Cable System, with the engine illustrated on the opposite page.

The Anchor is moved along the headland by the direct pull of the hauling rope and is provided with tynes which prevent any forward movement of the anchor until they are lifted by the rope. This is done automatically



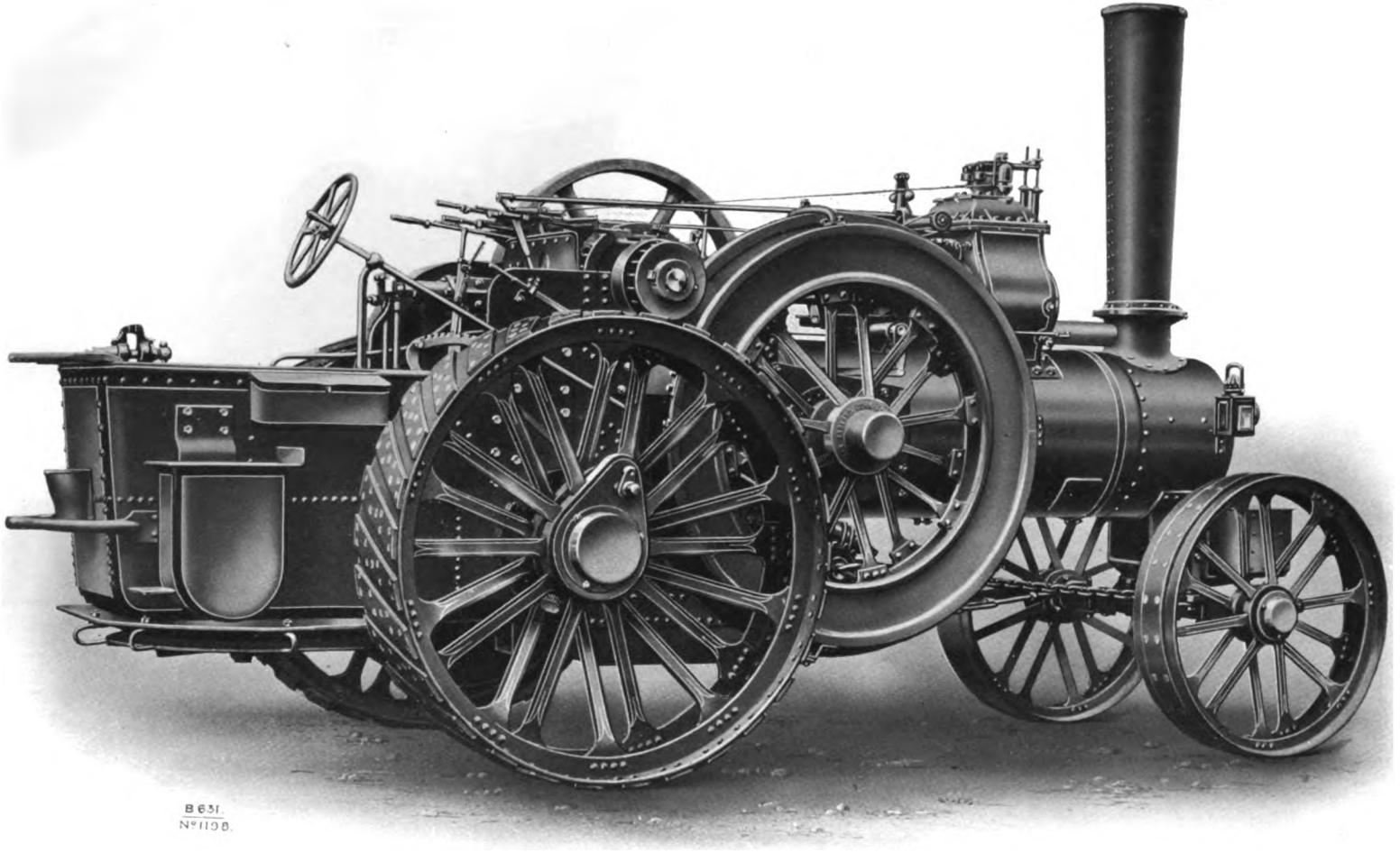
each time the implement comes up to the anchor, and it moves forward until the winding is stopped. The anchor is entirely self-acting and requires no attention, the distance moved forward each journey being controlled by the driver of the engine. The disc wheels with which it is provided resist, by cutting into the ground, all side strains put upon the anchor by either engine or implement. It is provided with a steerage which enables it to be worked along a crooked headland. One or two of the rope porters illustrated are used for carrying the rope which goes round the field.





Improved Compound Self-Moving Ploughing Engine

With Vertical Winding Drum



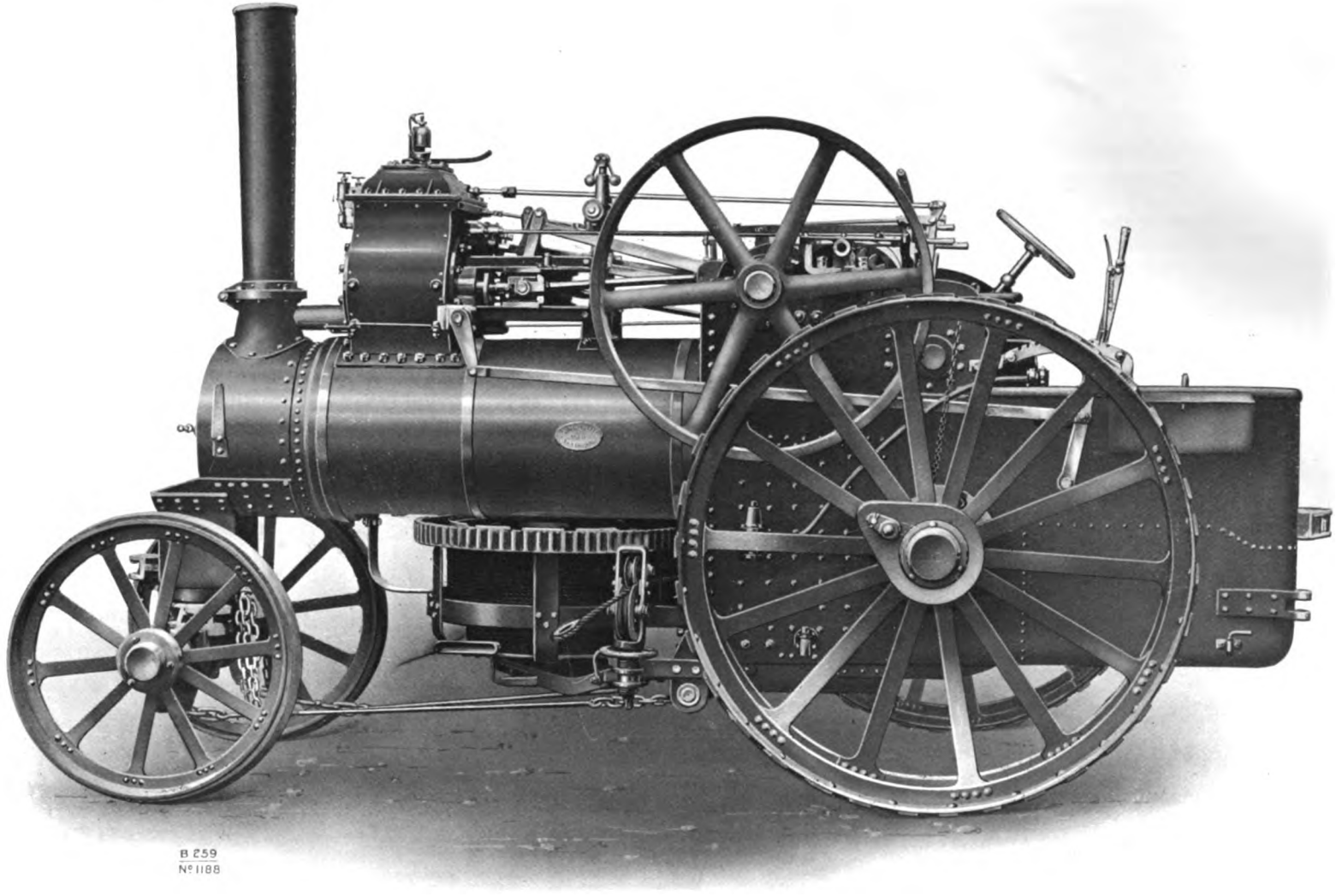
For Specification, see pages 24–27.

This Engine is for use with the Double-Engine System (see pages 18 and 19).

Engines fitted with horizontal drums and coiling gear give the best results in most conditions, but there are exceptional cases where the configuration of the country is such that this form of Engine is found suitable. It has a patented arrangement giving two speeds for both road and ploughing gears.

Improved Compound Self-Moving Ploughing Engine

With Main and Tail-Rope Drums



For Specification, see pages 24–27.

The above Engine is used in connection with the Single-Engine System with Single-Acting Implements as described on page 21. We also manufacture similar Engines to the above, but not fitted with Tail Rope Drums, for working on the Double-Engine System.

Steam Cultivating Implements

To meet the demands of modern Agricultural Science, a large variety of Implements are required for the tillage of the land. Not only must there be a large number of CLASSES of implements, such as ploughs, knifers, cultivators, ridgers, harrows, rollers, scoops, land levellers, draining, trenching, ditching, and combined implements, but each of these classes must be divided into many distinct TYPES to meet varying conditions; we manufacture for instance under the heading of Ploughs no less than eight distinct types, viz., Topsoil (Balance and Turn-round), Deep, Subsoil, Breaking, Vine and Heath, Fenland and Sewage. It has been found by experience that every type must be subdivided into varieties and sizes, each of which is distinguished by some essential feature such as, in ploughs, the number, width, and depth of furrows; shape or design of the mouldboard, share or plough body; the introduction of some special feature such as our Patent Anti-Balance Gear, Patent Lifting Gear for harrows and cultivators, etc., etc. Owing to the fact that the composition and consistency of land varies very largely, it is obvious that in the case of ploughs the suitability of the shape of the mouldboard and share to the land in question is of the first importance, otherwise good, clean work cannot be done. Unsuitability in design will not only make all the difference between good and bad work but also in the power required to operate the implement and consequently in the consumption of water and fuel, wear and tear on the engines, etc. In the case of Topsoil Ploughs we manufacture and have a constant demand for as many as 300 varieties and sizes, and we can confidently claim that at the present day we are not only in a position to supply to any part of the civilised world any type of Steam

Cultivating Implement known to modern Agricultural Science, but to supply that particular size or variety of it which shall be most suited to the work, taking into consideration the country, climate, soil, and crop.

On account of the expense involved it is often impossible for the Farmer to possess all the implements he would wish to have, and we have always kept this in view in the design of our implements by so constructing them, that they are capable of doing the largest possible variety of work consistent with their efficiency for the work they are specially intended for.

It is impossible in the space of a catalogue to illustrate and describe all the various types and varieties of implements which we manufacture, but in the following pages we have shown one or two varieties of each of the leading types. The particular work for which each type illustrated is intended, and the circumstances and conditions which it is specially designed to meet, are as far as possible set forth. It is, however, of the greatest importance that we should, before being asked for any particular implement, receive the fullest information possible regarding the character of the work it is proposed to do, the composition and general character of the soil in which the implement is to work, and the nature of the crops to be raised.

In spite of the great variety of implements which we manufacture, we are often called upon, owing to some advance in Agricultural Science, to design some new implement or new variety to meet changed or fresh combinations of conditions. We are always prepared to undertake such work and to carry out the necessary experiments. For

Steam Cultivating Implements (continued)

example, we have, during the past few years, introduced several new and highly-successful implements, such as the Turn-round Disc Plough (pages 52 and 53), the Fenland Plough (page 64), the Spring Tyne Cultivators (pages 70 and 71), the Ridging Machines (pages 72 and 73), and the Disc Harrows (pages 80 and 81).

With regard to the quantity of work that can be performed by the various implements hereafter mentioned, we do not think it advisable to publish any figures. Such figures can only be misleading, dependent as they are on a large variety of conditions, such as the size of the implement, the power of the engines, the fuel available, the width and depth of the furrows, the condition of the land, hours of work, and efficiency of the management and labour, but we claim that in consequence of the large number of protected improvements which are embodied in our machinery, each of which essentially contributes to the efficiency and expeditious working of the plant, a set of our Tackle is capable of more work per day under equal conditions, and at a less expenditure of labour and fuel, than that of any of our imitators.

Intending purchasers, however, will naturally desire, unless they are well acquainted with Steam Cultivation, to have at any rate an approximate idea as to the acreage that can be done, and when we are in possession of the information which enquirers are asked to supply (see "Customers Abroad," page 14), we can furnish particulars, based on actual experience, which will enable the customer to form a very good idea as to the capacity of any of our implements.

Fowler's Patent Improved Anti-Balance Gear

The first arrangement of anti-balance gear was introduced by us in 1885. Certain difficulties having been experienced with this gear, we introduced in 1899 our smooth roller anti-balance gear. Again, in 1905, further improvements were effected and we introduced the gear illustrated on the following page, which has many advantages over either of the two former types.

This important invention can be applied to all our standard ploughs, and for shallow ploughing it is indispensable. More than 700 implements have been fitted by us with this gear, which has always given the greatest satisfaction. The object of the gear is to keep the plough steadily to its work, and produce an even depth of furrow, which is difficult to secure on uneven land with balance ploughs, particularly in shallow work. In stony land, and in ploughing land for the first time, it is not always advisable to work on the anti-balance principle; we therefore have arranged means for using ploughs fitted with this gear either as balance or anti-balance, as described on the following page.

Fowler's Patent Improved Anti-Balance Gear (continued)

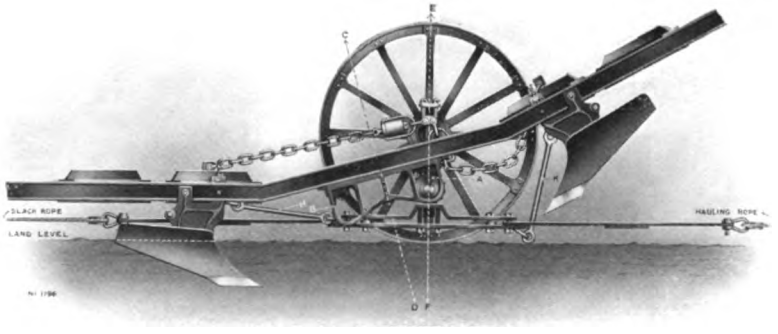


FIG. 1.

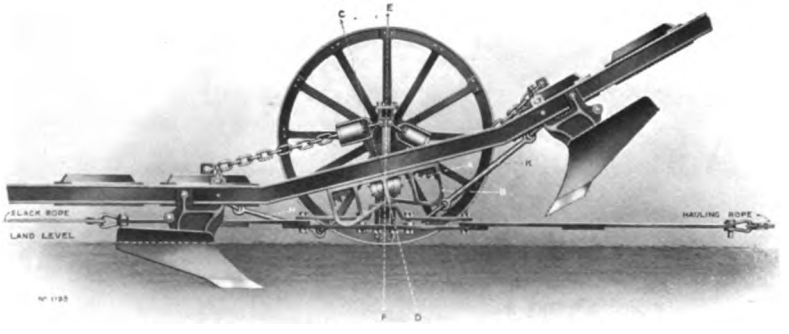


FIG. 2.

Figure 1 shows a plough at work with the Anti-Balance Gear in action, and Figure 2 shows the same plough with the gear arranged so that the plough is converted for the time being to the Balance Type.

When out of work, *i.e.*, when travelling on the road or when swinging into new work at the headlands, the pinions A rest in the centre of the frame B as shown in Fig. 2, and the centre line or centre of gravity of the plough frame CD coincides with the centre line of the plough carriage E F, the Implement being thus in Balance. When the plough is entering the work, the pull on the hauling rope G causes the plough carriage to move forward under the frame until arrested by the adjustable check rod H, the centre lines C D and E F then occupying the relative positions shown in Fig. 1. The effect of this is to throw the plough frame out of balance and to concentrate more than half the weight of it on the shares in work, thus preventing the tendency to jump and producing uniform depth of tilth.

An arrangement by which the travel of the pinions A, and consequently the overbalance of the plough frame, can be adjusted to suit the soil in which the plough is working, is provided by the check rods H and K, which can be slackened so as to allow of any required movement up to the full extent allowed by the frame B, as shown in Fig. 1, or they can be tightened so as to allow no travel at all as shown in Fig. 2, the plough then working in Balance.

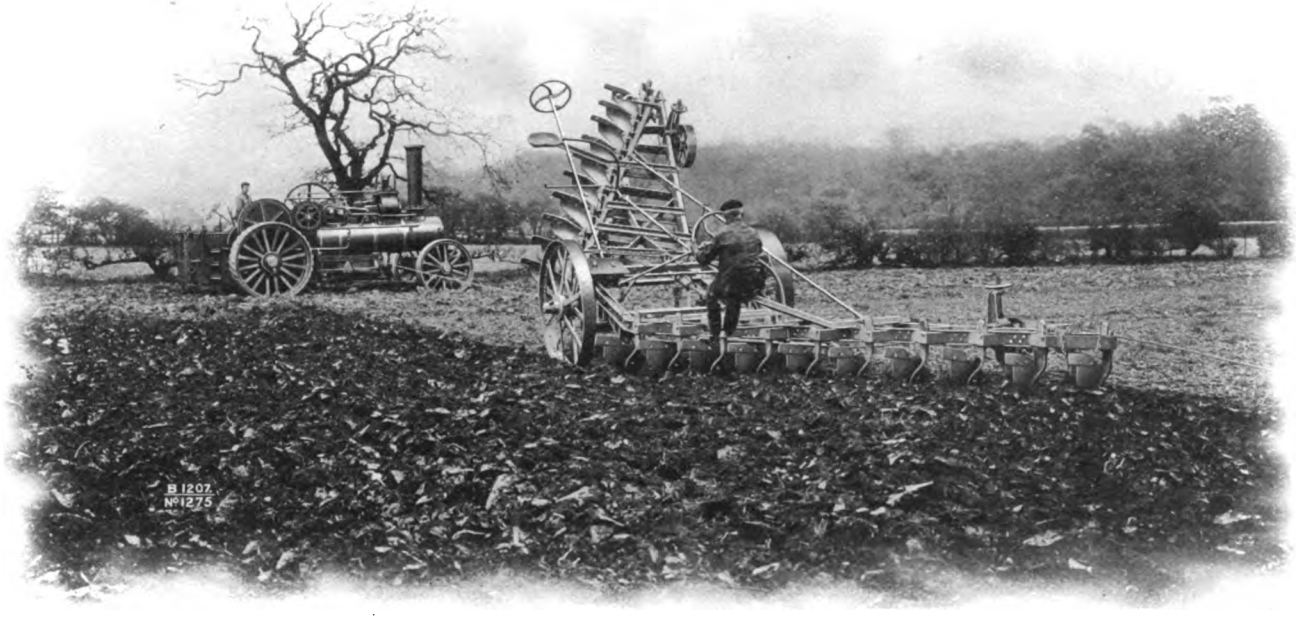
Considerable economy is effected by the use of this gear owing to the high speed at which ploughs fitted with it can safely be run.

Topsoil Ploughs

Balance Type

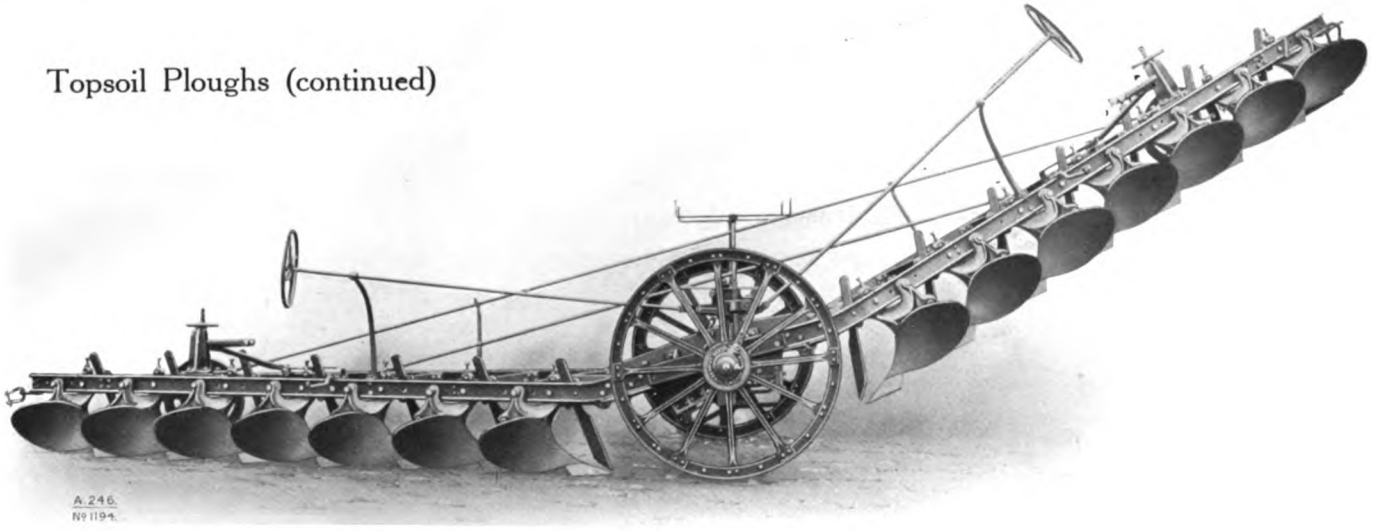
Implements of this type are used for ploughing land which has already been under cultivation for cereal and root crops, chiefly by Farmers in Europe. They are generally fitted with our Patent Anti-Balance Gear, full particulars of which will be found on the two preceding pages, and when so fitted can be used on either the Balance or Anti-Balance principles. Though generally used as Anti-balance, discretion must be exercised in so using them when stones and roots are likely to be met with in the land.

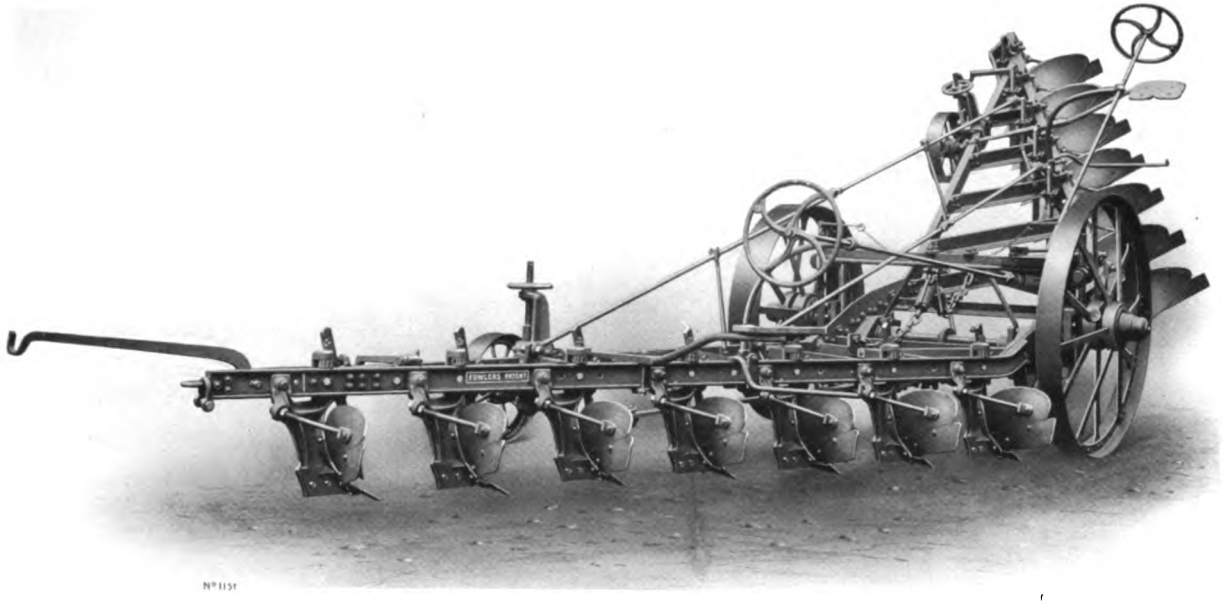
We manufacture this type of plough in more than 300 varieties and sizes, ploughing from 4-ft. to 10-ft. in width at a depth varying from 6 to 12 inches.



Special Type 9/10-Furrow Balance Paring Plough, fitted with Anti-Balance Gear.

Topsoil Ploughs (continued)





The illustrations above show two varieties of Balance Topsoil Ploughs, both fitted with Anti-Balance Gear.

Balance Topsoil Plough at work in Germany.

Topsoil Ploughs (continued)

Turn-Round Type

Where a large acreage of Topsoil Ploughing is required this type of Implement will be found to be of exceptional value owing to the high speed at which they can be worked, and the rapidity with which they are turned at the headlands. This type of Plough also can be pulled up so close to the engines that only very narrow headlands are required.

Since the introduction of our Turn-Round Plough in 1893 (gaining the Royal Agricultural Society's highest award in the following year) the experience gained with it in practical work in many parts of the world has enabled us to effect numerous improvements whereby the mechanism has been simplified and the wearing parts reduced.

Every movement of the Plough is automatic, being controlled either by the pull on the ropes or by the steersman. A double set of skifes and mouldboards are provided, which are alternately thrown into work automatically with the turning of the implement at the headlands, so that the furrows are all thrown in one direction.

We manufacture several sizes and varieties of this type of plough, one of which is illustrated on the opposite page. They can be fitted when required with Digging Breasts and various types of Cultivating Tynes instead of skifes and mouldboards, so that a variety of operations can be performed. Up to the present time we have constructed this implement to plough from 6-ft. to 8-ft. in width.

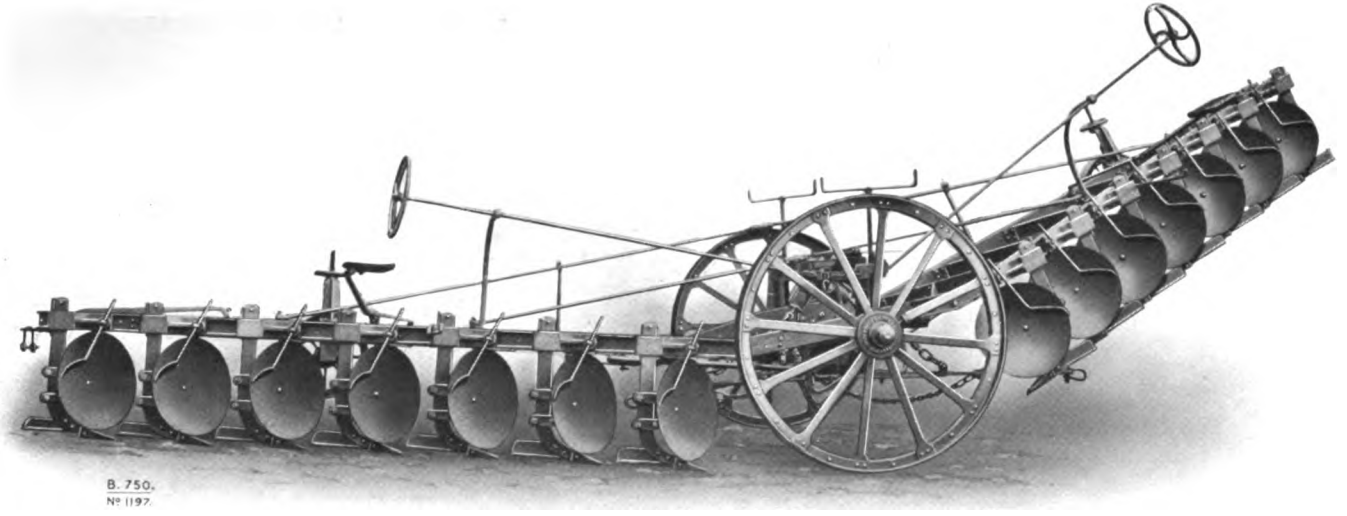
Turn-Round Plough at work on English Stubble Land.

Topsoil Ploughs (continued)

Balance Disc Type

This Type has been introduced by us to meet an urgent want which has arisen in connection with the practice of manuring land by ploughing in green crops. To obtain the full manurial value of the growing crop it is necessary to plough this in and bury it at a certain stage of its development, so that it is often the case that this operation is performed during wet weather when the crop is damp and matted. Our Disc Type of Plough has been found to be much more suitable for this class of work than the Mouldboard Type. While covering the growing crop lightly with soil, the Disc Plough also subsoils the ground beneath. All Disc Ploughs are fitted with out Patent Anti-Balance Gear (see pages 43 and 44).

These ploughs can be converted to the ordinary type by the substitution of skifes and mouldboards for the discs. They are made to work at a maximum depth of 8–12-in., covering various widths to suit the conditions.



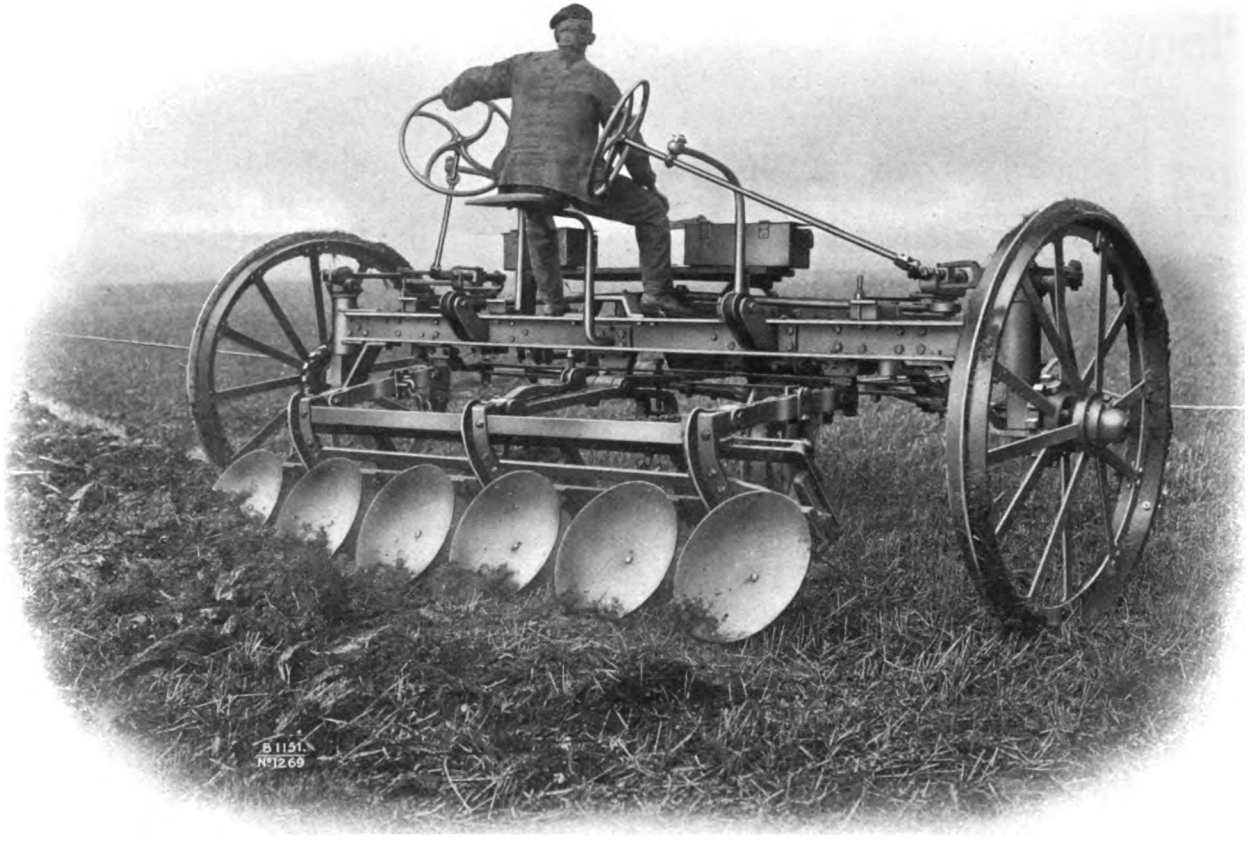
Balance Disc Plough fitted with Anti-Balance Gear.

Disc Plough ploughing in a Green Seradella Crop at Allerheiligen near Oels, Prussian Silesia.

Topsoil Ploughs (continued)

Turn-Round Disc Type

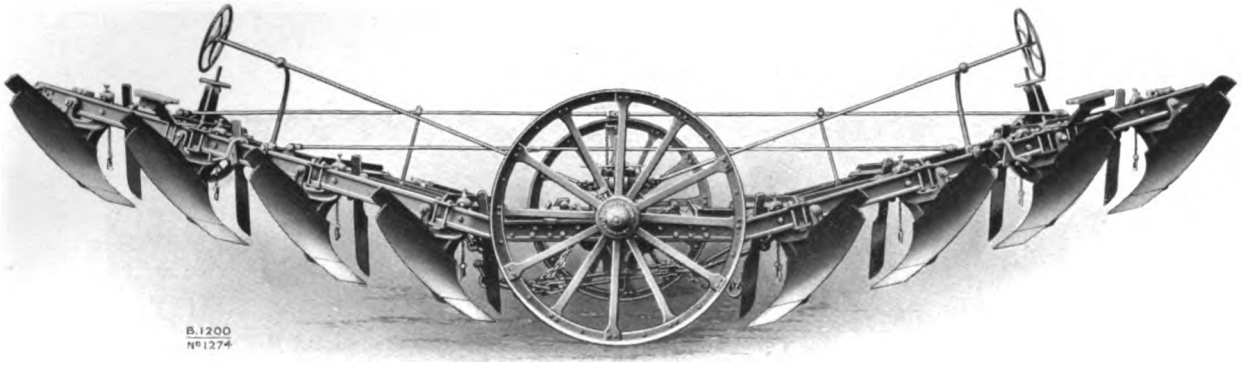
The above illustration shows a Disc Plough constructed on the Turn-Round principle. It has all the advantages which this construction gives, as described on page 48. No subsoil tynes are fitted to this type of Disc Plough. The illustration on the opposite page shows the implement being turned at the headland.



When being turned at the headlands the discs are lifted out of the ground by the pull on the rope, and take up the turning position as shown above ; when the turning movement is completed they are adjusted to the correct position for the return journey, each movement being automatic in its action.

Deep Ploughs

Implements of this type are used on cultivated land when a greater depth of tilth is required than can be obtained with the Topsoil Ploughs already described. They are principally used in connection with the cultivation of root crops.



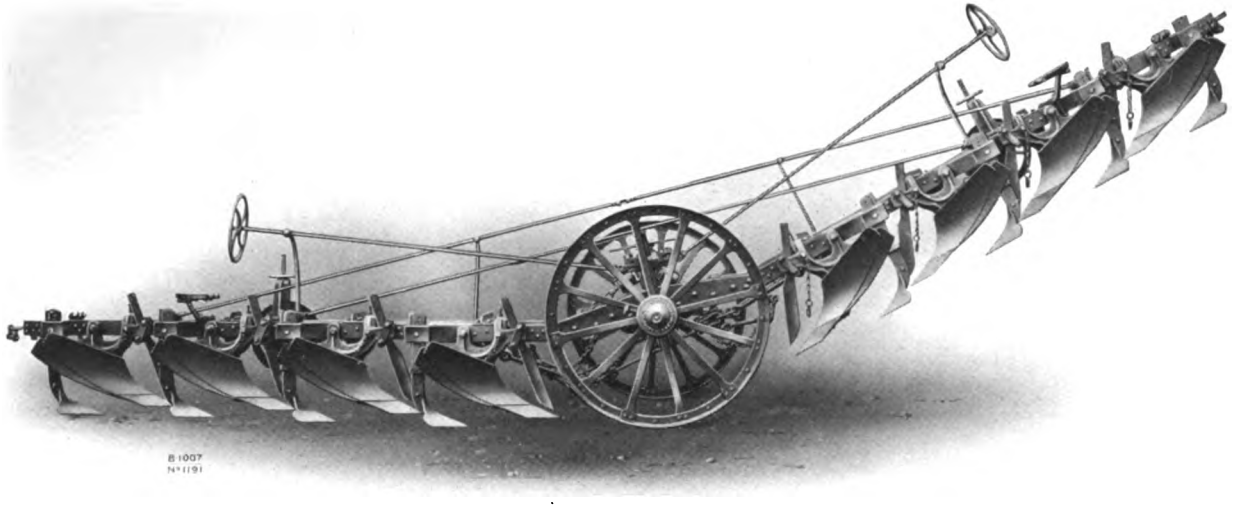
We manufacture these Implements in about 100 varieties and sizes, ploughing from 3-ft. 6-in. to 6-ft. 6-in. wide by 10-in to 16-in. deep.

Deep Plough at Work on Heavy Clay Land.

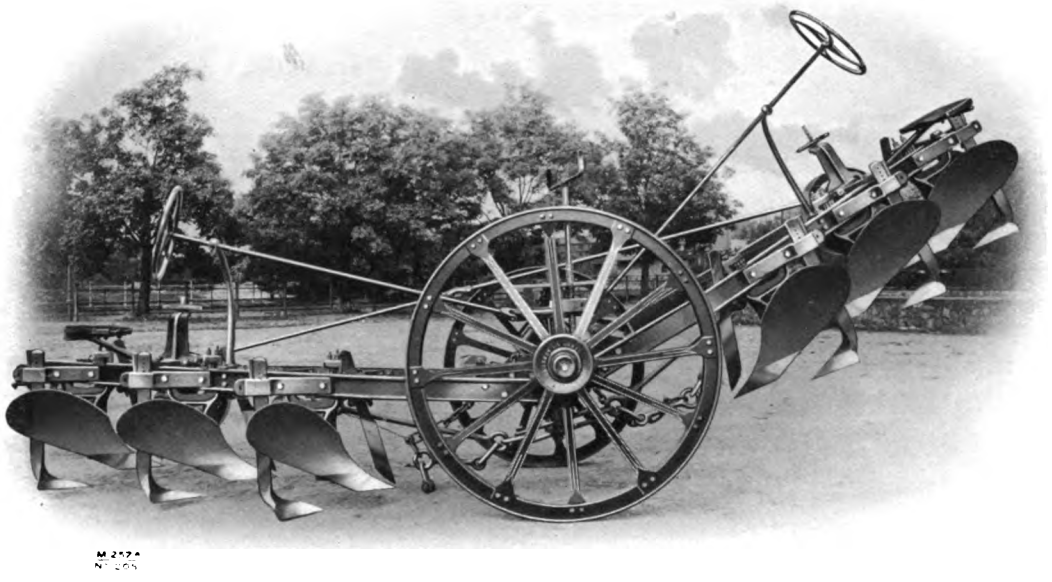
Subsoil Ploughs

This Type of Plough is also used in connection with cereal and root crops and is a comparatively modern production. Formerly, it was usual for Farmers to plough the land slightly deeper each year so as to gradually increase the layer of fertile soil, but in recent years this object has been attained more rapidly by the use of Subsoil Ploughs, which, by means of Tynes fitted to the frame behind the plough bodies, break up the land below the furrow without bringing it to the surface. Thus the drainage is improved, the capacity of the land for storing moisture is increased, and the roots of plants can readily penetrate the subsoil.

We manufacture about 170 varieties and sizes of this Type of Plough, constructed to plough and subsoil to various widths and depths.



Balance Subsoil Plough.



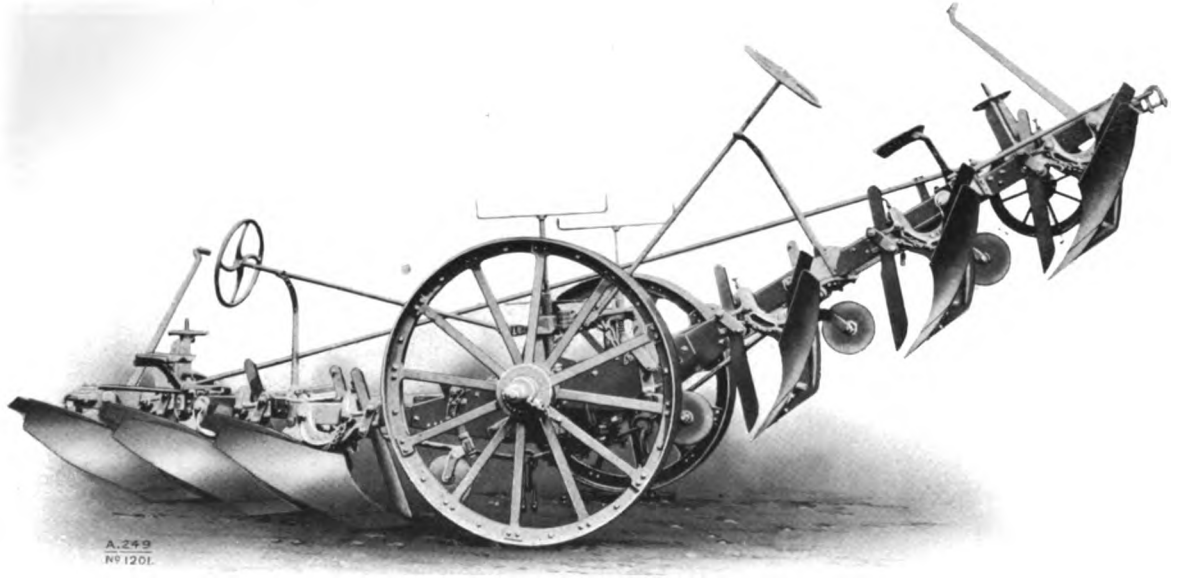
Balance Subsoil Plough.

Subsoil Plough at Work.

Breaking Ploughs

These implements are specially constructed for breaking up virgin land and for deep ploughing on land already cultivated. They are largely used in connection with the cultivation of sugar cane, sugar beet, and tobacco. The construction differs materially from that of the Topsoil and Deep Ploughs already described owing to the exceptional strength required and the extra clearances necessary to prevent the plough choking with surface growth of bushes, grasses, cane roots, etc.

The first plough of this type was manufactured by us in 1875, for Cuba, where it proved so successful that ploughs of similar construction were supplied to many other parts of the world; a large demand has since arisen for this Type of Implement. It is now manufactured by us in 130 sizes and varieties ploughing to a width of from 4-ft. to 7-ft., and to a depth of from 10-in. to 20-in.



Balance Breaking Plough.

Breaking Plough at work in Cane Stubble Land at Mopea, on the Zambesi River, Portuguese East Africa.

Breaking Plough at work in Land covered with Weeds.

Breaking Plough, fitted with Wrought-steel Skifes, Revolving Coulters, and Skimmers, at work in California.

Heath Plough at Work.

Vine and Heath Ploughs

This Type of Implement is constructed for reclaiming heath land and for Vine, Tree, Hop and Liquorice Cultivation. It is specially useful for breaking up the hard-pan, which is often found at depths varying from 12-in. to 30-in. The first plough of this Type was manufactured by us in 1871 for His Highness the Duke of Arenberg, and since then the design has been continually improved as the result of costly experiments in many parts of the world.

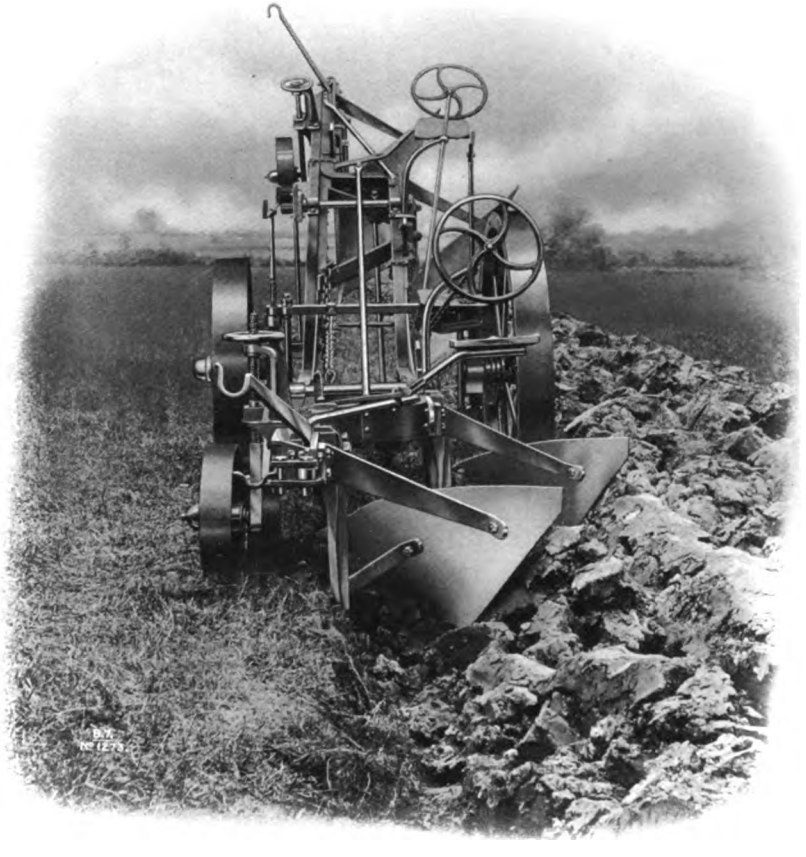
The cutting point of the share is made of a highly-tempered tool-steel bar, easily renewable at small expense when worn, the plough bodies and the mould-boards are made in two parts so that the portions subject to the most wear may be easily and cheaply replaced.

In addition to the plough bodies,—subsoil tynes, revolving or knife coulters, and skimmers can be fitted to the frames; see illustration on page 63.

These ploughs have been in regular use for the past 30 years for preparing land for vineyards, for reclamation work, and also for hop and sugar cane cultivation and afforestation work.

From land ploughed by one of these Implements a yield of as much as eleven tons of granulated sugar per acre has been obtained in the Sandwich Islands.

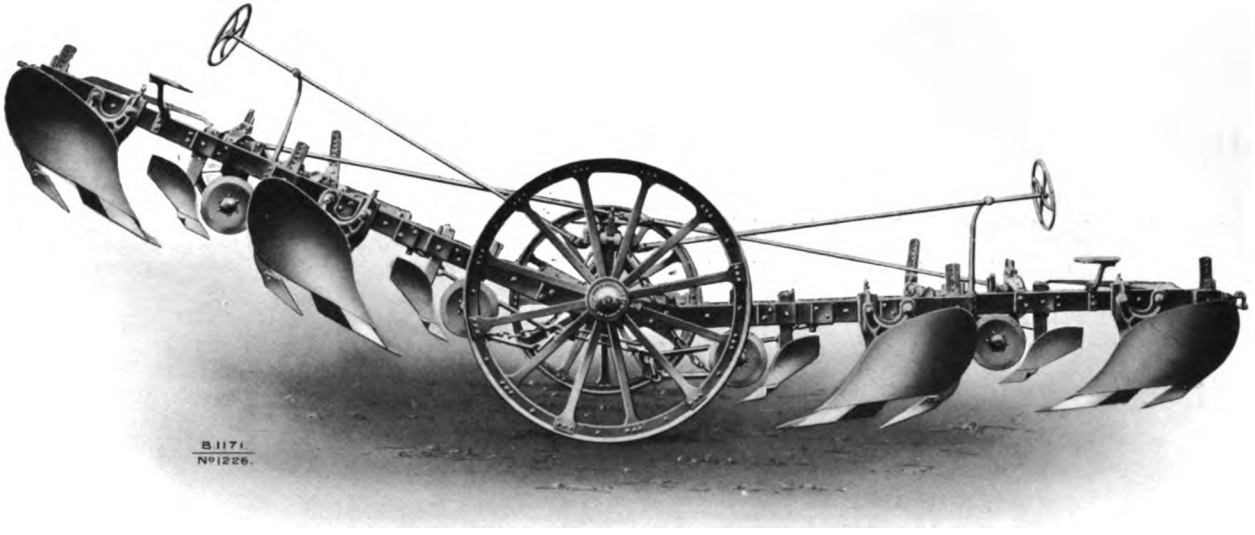
We manufacture 18 varieties and sizes of this type, ploughing a width of from 20 to 40 inches, at depths varying from 20-in. to 24-in. and subsoiling 6-in. to 8-in. deeper.



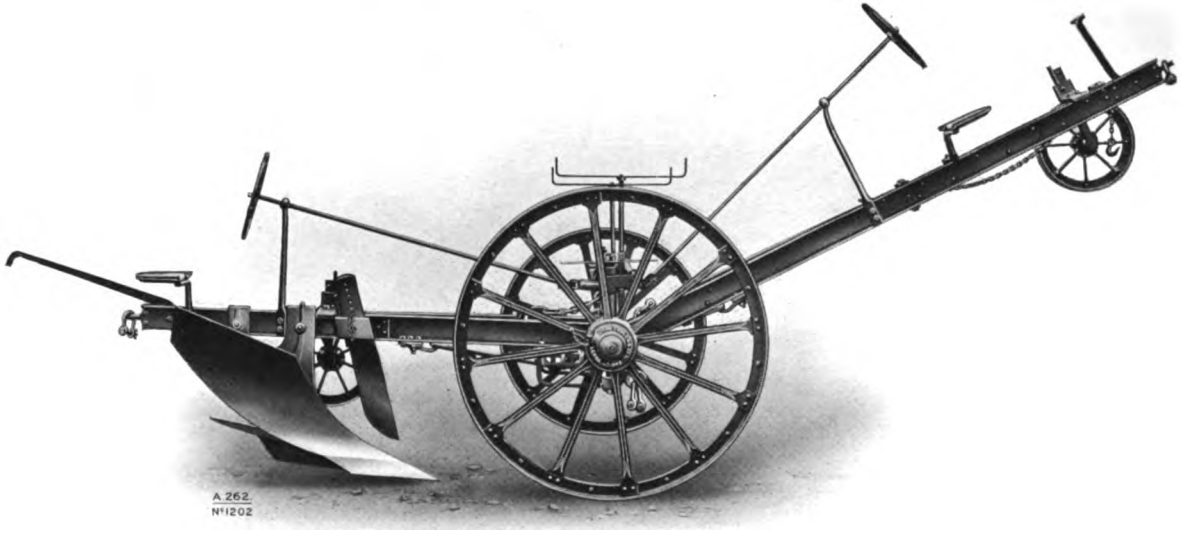
Vine Plough at Work.

Vine and Heath Ploughs (continued)

Heath Plough at work for Forest Cultivation.



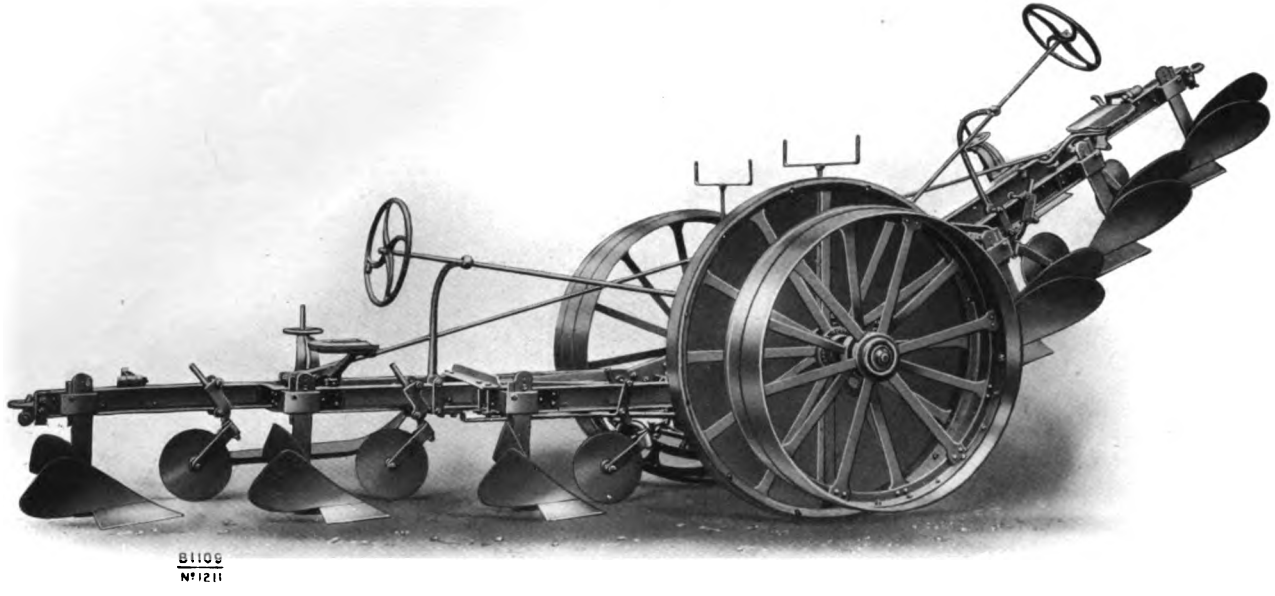
Balance Vine and Heath Plough, fitted with Subsoil Tynes, Revolving Coulters and Skimmers.



Single-Acting Balance Vine Plough, for working with the Single-Engine System, with Single-Acting Implements, described on page 21.

Fenland Ploughs

This Type of Plough is designed for ploughing land containing a large percentage of moisture and it will work on ground which will not carry the weight of a horse. It is of the lightest possible construction consistent with the requisite strength and the weight is supported by special wheels and skids.

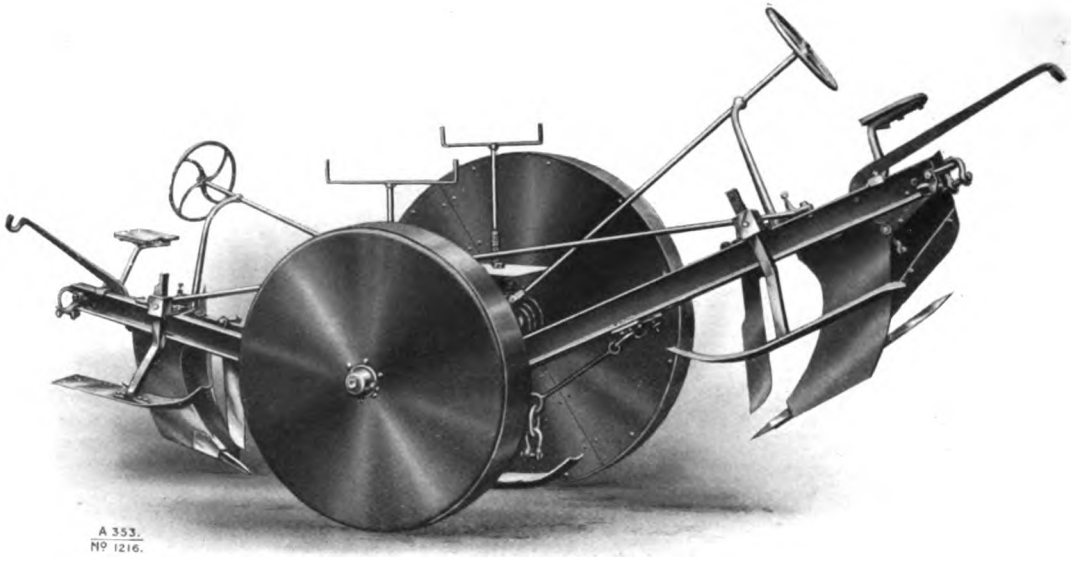


The reclamation of fen and bogland which has been partially drained can be completely effected by the use of this implement.

We manufacture many varieties of this type of plough, but before recommending any one in particular it is necessary that we should have the fullest information with regard to the conditions under which the implement is to work.

Sewage Ploughs

Nearly all the principal Sewage Farms in this country have been supplied by us with ploughs of this Type, and we are prepared to supply copies of reports on the working of these ploughs (prepared by our customers) on application.



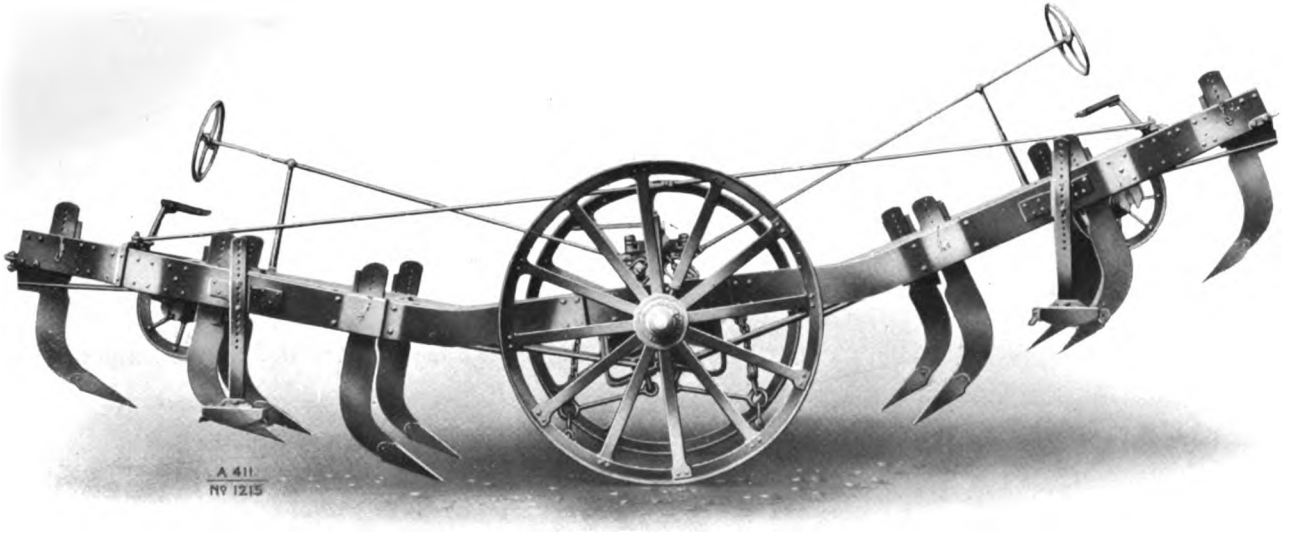
The object of these ploughs is not only to plough in the solid sewage matter deposited on the surface, but to very largely increase the filtration efficiency of the land.

As in the case of the Fenland Plough, described on the opposite page, the weight of the Plough is supported by skids in addition to the wheels, and sometimes by an extra furrow wheel.

Knifers

This Type of Implement is used for clearing virgin land of roots, large stones, and rocks, and is also used for knifing heavy clay land, greatly assisting the drainage. It is constructed to work on the Balance principle, but to do the most effective work it is fitted with our Patent Anti-Balance Gear (see pages 43 and 44). The tynes are of special steel with hardened wrought-steel points. We have made many of these implements for reclamation work in all parts of the world, and after the roots and stones have been removed by the knifer, any of our Ploughs can be used without risk of damage.

We manufacture these Implements with either three or five tynes, and with frames 8-in. and 9-in. deep. The tynes vary from 5-in. by $1\frac{1}{4}$-in. to 9-in. by $1\frac{3}{4}$-in. in section.



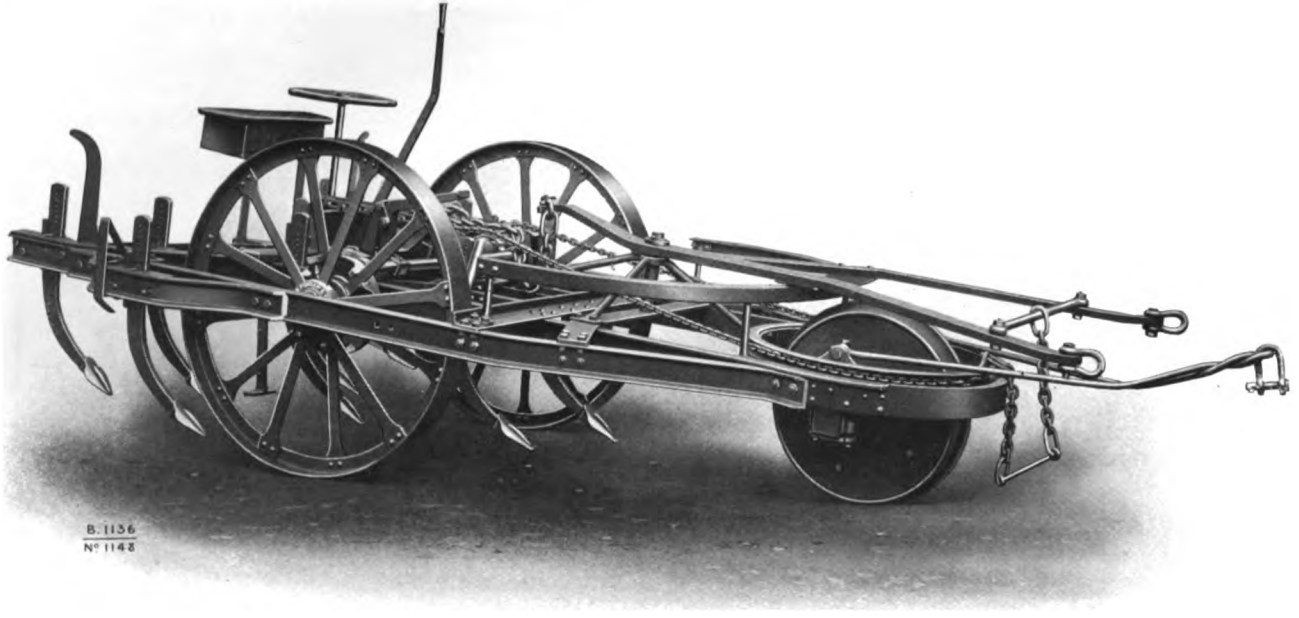
Five-Tyne Balance Knifer, fitted with Anti-Balance Gear.

Five-Tyne Knifer, fitted with Anti-Balance Gear, at Work in the Hawaiian Islands.

Clearing the Land of Roots and Stones.

Cultivators

Where the land is required to be thoroughly stirred but not turned in as in ploughing, these implements are specially suitable. They are also used for opening the land beneath the furrows to assist drainage, for breaking large clods turned up in deep ploughing, and for removing the hard pan formed by the treading of animals. Owing



to the speed at which they can travel over the land and the facility with which they are turned at the headlands, a large quantity of work can be done per diem. All Cultivators are fitted with an automatic arrangement for lifting the tynes when turning at the headlands, the tynes being lifted clear of the ground by the pull on the turning lever

Cross Cultivating on Ploughed Land at Mopea, on the Zambesi, Portuguese East Africa.

before the Implement commences to turn. In addition, these Implements are fitted with our latest improved patented arrangement for lifting the tynes whilst travelling across the field, enabling the steersman to clear the tynes of rubbish or remove them from the ground to avoid an obstacle, without any loss of time. They are also fitted with our recently patented arrangement for preventing any danger of the Implement turning over at the headland when the ground is very soft or rough.

We manufacture 12 varieties and sizes of this Type of Implement, covering a width of 6-ft. to 11-ft., and cultivating to a depth of 6-in. to 9-in. We also manufacture 36 varieties of tyne points.

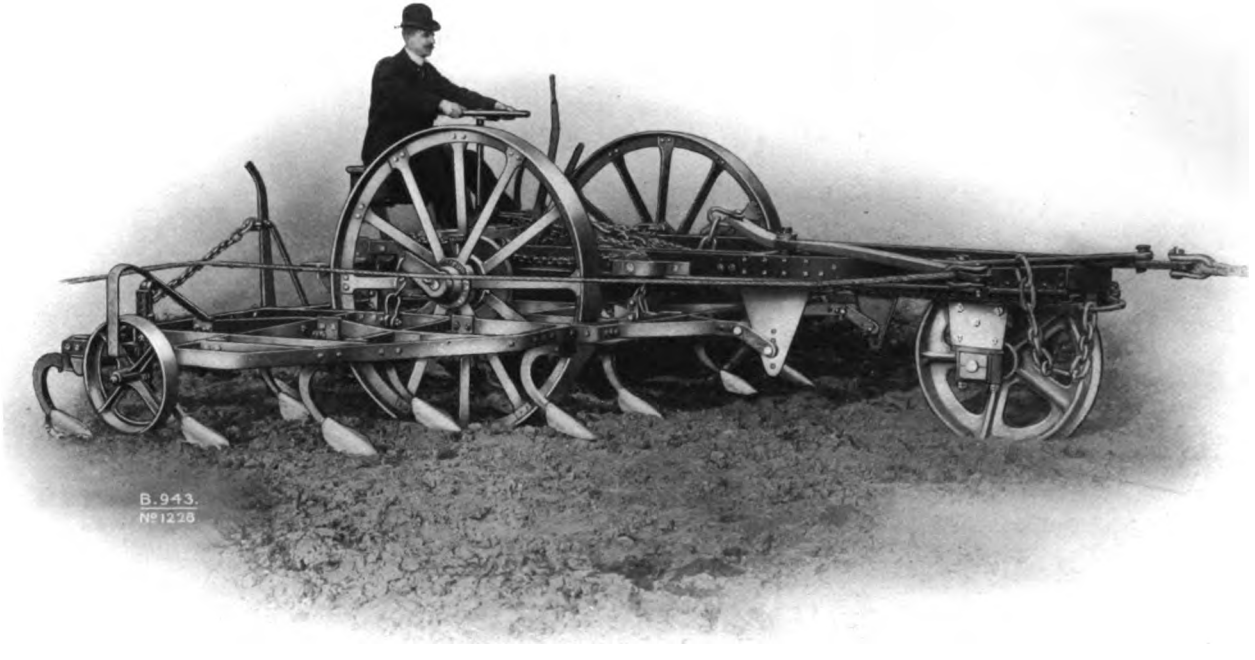
Cultivator at Work in England.

Cultivators (continued)

Spring-Tyne Cultivators

Spring-Tyne Cultivator at work.

This Implement is used principally for breaking up stubble land after harvest, 4-in. to 5-in. deep, preparatory to ploughing it later in the Autumn. After the land is broken up, a green manure seed is generally sown; this, together with any corn that has been involuntarily sown during harvest, weeds, etc., produces a suitable crop of green



Same Implement with Tynes Lifted.

manure, and when ploughed in later in the year, leaves the land perfectly clean. This operation also destroys many insects and parasites that breed in the stubble. The implement can also be used for harrowing.

We manufacture several sizes of this Type of Implement covering widths varying from 12-ft. to 18-ft.

West Indian Cane Field, Ridged and Partly Planted.

Ridgers

These Implements are of similar construction to the Cultivators already described, with the exception that they are fitted with ridging bodies in place of the cultivator tynes. They are used for banking up ridges for the planting of sugar cane as done in the West Indies and other sugar growing countries, and are also extensively used in connection with cotton growing in Egypt and elsewhere.

To suit certain conditions, a combination of Cultivator and Ridger can be effected by the use of both the Cultivator tynes and the Ridging bodies on the same frame.

In some countries, in consequence of irrigation ditches and other obstacles, a turning implement is found unsuitable for this work, and for such countries we manufacture a Ridging Implement on the Balance principle.

We manufacture 20 varieties and sizes of this Type of Implement to suit any required depth and width of ridge.

Balance Ridger at Work.

Special Type Ridger at Work.

Ridger, with Adjustable Mouldboards, at Work.

Beetroot Lifters

This Implement is designed to supply a long-felt want amongst sugar beet growers for a machine which will materially reduce the amount of labour necessary for lifting the beets by hand.

Beetroot Lifter at work in Germany.

The construction is entirely special and has only been perfected after many years experimenting. It loosens the beets and slightly lifts them, leaving them in such a condition that they can be left in the ground, if necessary, for a week, and can then be easily removed by hand without the use of hand implements. A great variety

of points are necessary to suit different conditions of soil. It is turned at the headlands in a similar manner to our turning cultivators, but in addition a disc-ended strut is provided which effectively prevents the implement from running back and so injuring the crop when turning. Our latest improved patent self-acting lifting gear is also

Same Implement, with Tynes Lifted.

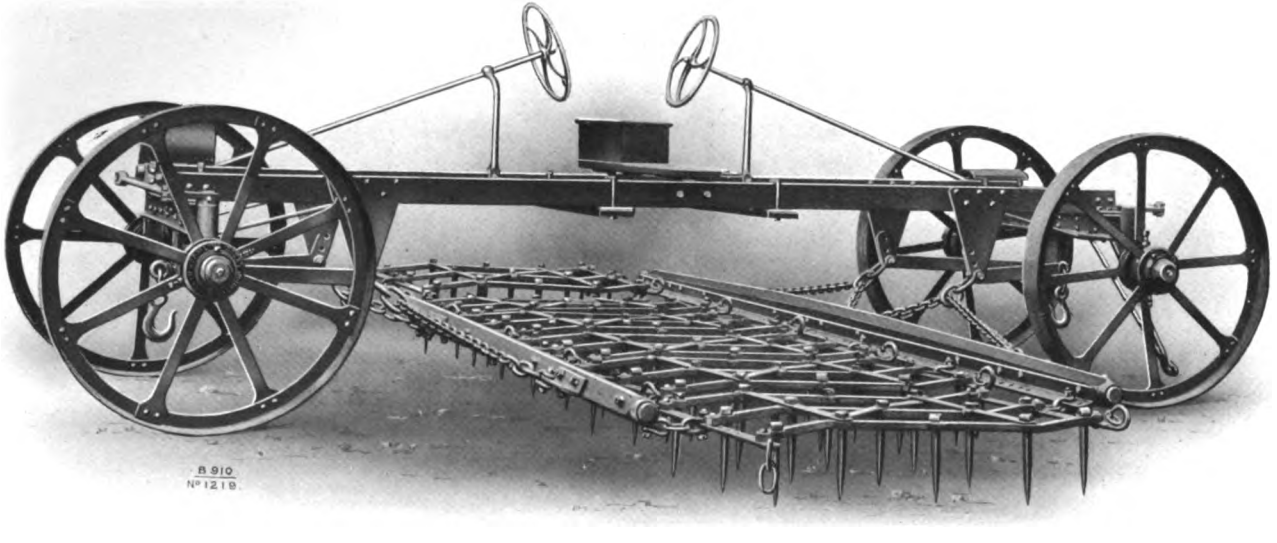
fitted. The steersman has perfect control of the machine, which is easily steered between the rows of beet, each tyne lifting two rows at a time. We manufacture this implement in four sizes, taking from four to ten rows, according to the width of the plant-rows and the local conditions.

Harrows

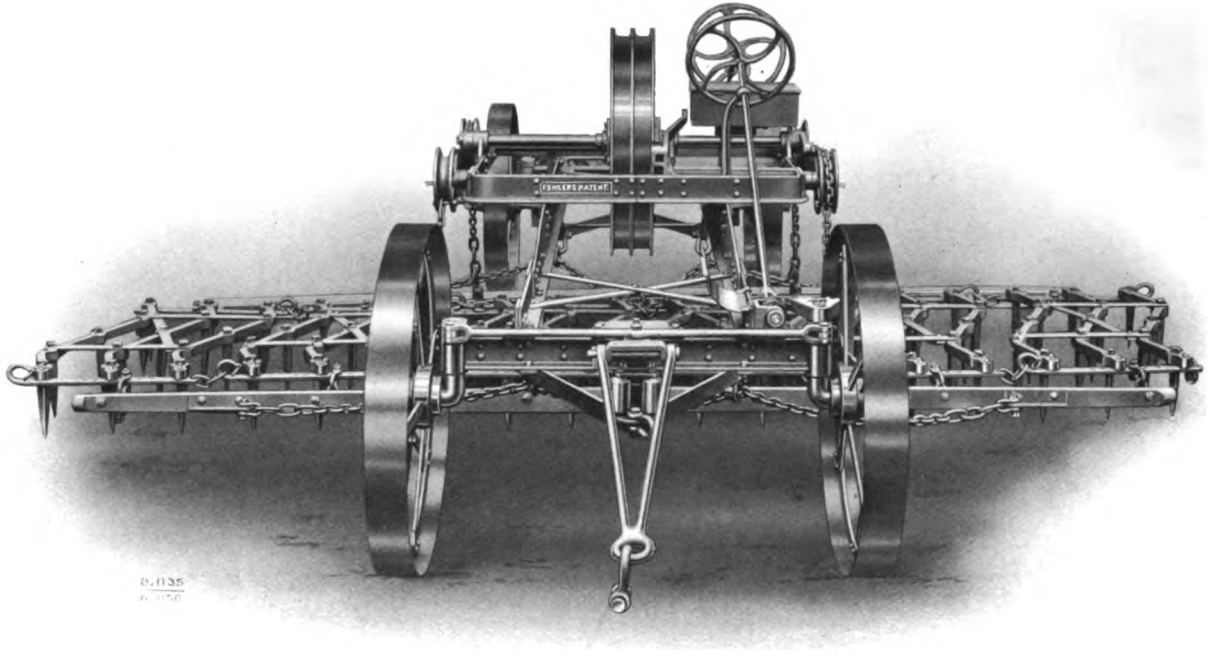
Flat Harrows

We manufacture this Type of Harrow in two sizes, 5-flat and 6-flat. They can be fitted with our Patent Drum Lifting Gear for raising the flats out of work to avoid choking.

These Implements can readily be converted into Rollers (see page 82); they are fitted with two types of flats and we manufacture them to cover widths of from 12-ft. to 18-ft.



Six-Flat, High-Frame Harrow.



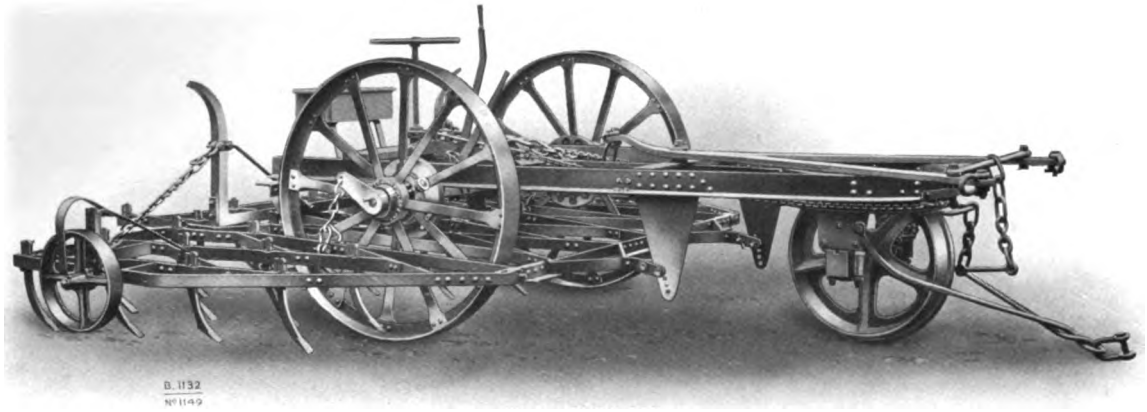
The illustration above shows one of our 6-Flat, High-Frame Harrows, fitted with our Patent Drum-Lifting Gear by means of which the flats can be lifted, to clear the points of refuse, at any time during the passage of the harrow across the land.

Harrows (continued)

Turning Harrows

These Implements are used after harvest instead of the flat harrow.

The frame is so designed that it will take a variety of points and tynes. The side wings are hinged so as to accommodate themselves to the undulations of the land and to allow of their being suspended when travelling on the road.



They are fitted with two independent Lifting Gears, as fitted to our Cultivators.

We manufacture this implement in two sizes, harrowing a width of 10-ft. and 15-ft. respectively.

15-ft. Turning Harrow, fitted with Patent Lifting Gears, at work.

Same Implement, with Tynes Lifted to clear the Points.

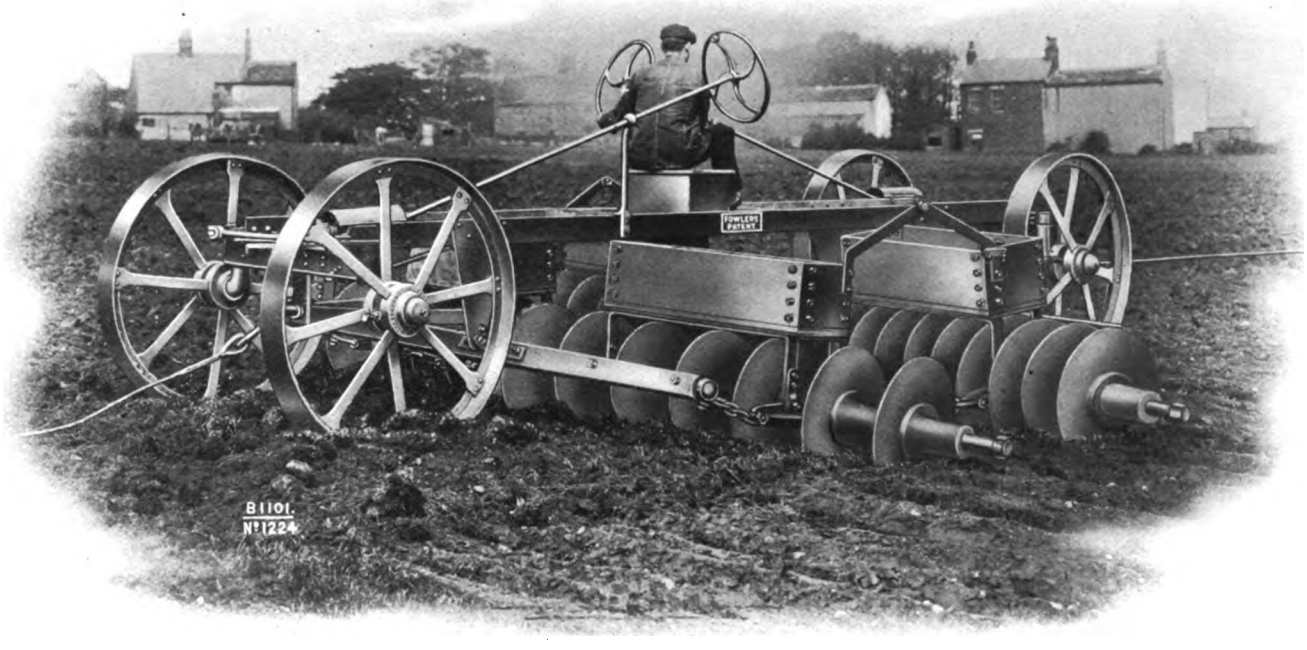
Disc Harrows

In this Type of Implement the Discs are so arranged in the frame, and are so designed as to effectively move, disintegrate, and aerate the surface of the land. They are fitted with Lifting Gear whereby the discs can be readily raised.

We manufacture several varieties and sizes, two of which are here illustrated.

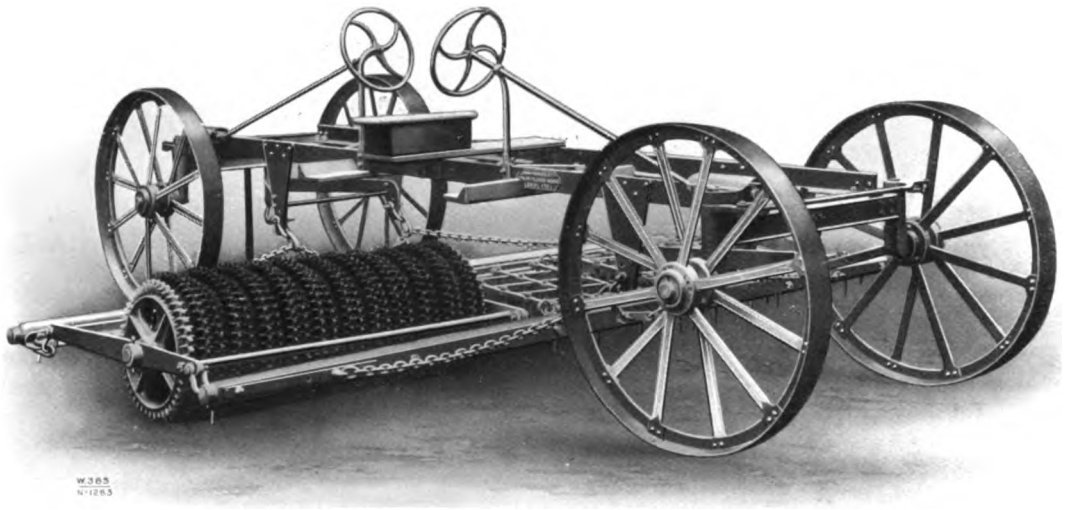
See also Discer at work (pages 114 and 115).

Two-Shaft Concave Disc Harrow, covering a width of 7-ft.



Four-Shaft Flat Disc Harrow, covering a width of 17-ft.

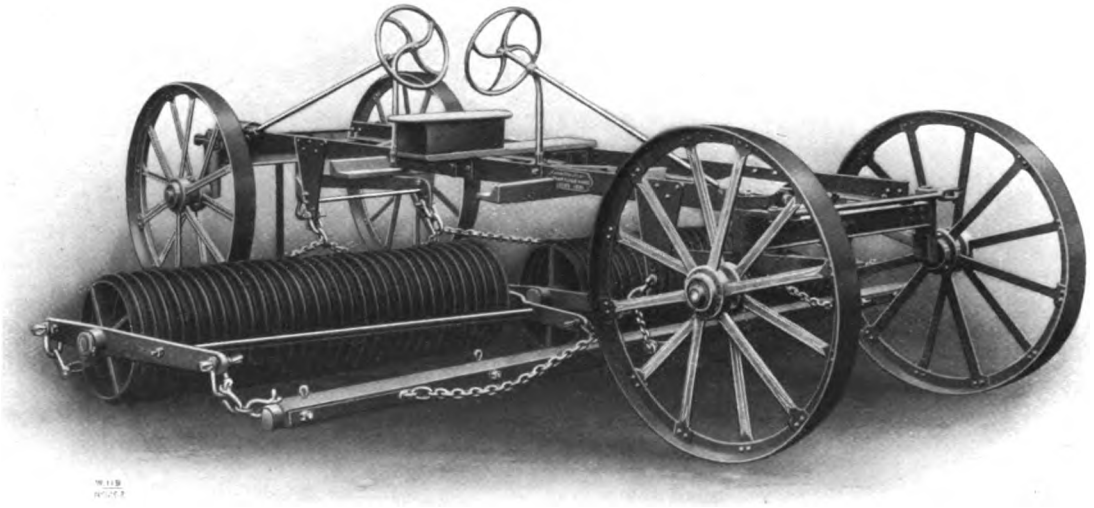
Rollers



Combined Crosskill Roller and Harrow.

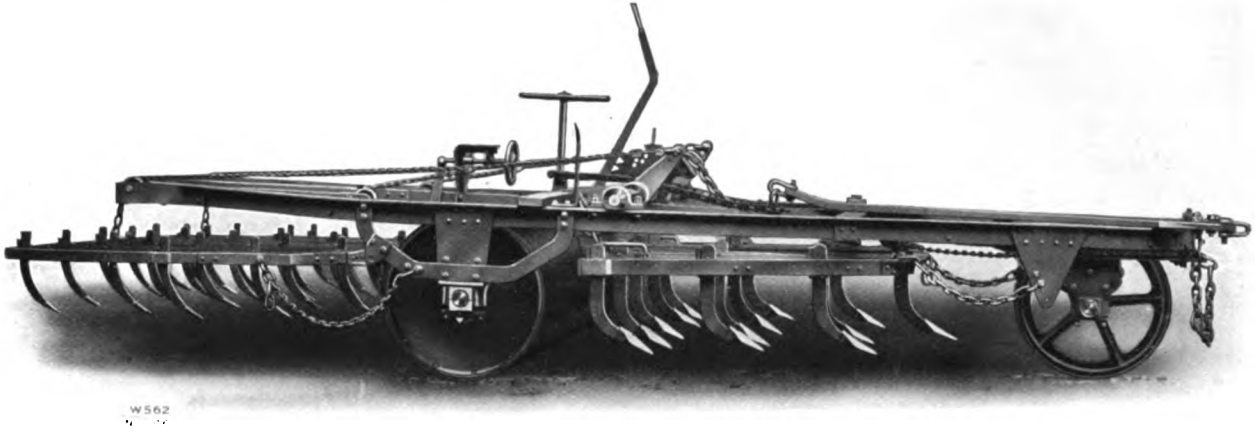
All our High-Frame Flat Harrows can be readily converted into Rollers of all Types by the substitution of the rollers for the harrow flats, the same poles and chains being used. The implement can also be worked as a Combined Roller and Harrow, see illustration above.

We manufacture various Types of Rollers, covering widths up to 18-ft.



Double Cambridge Roller.

Combined Implements



Combined Implement for Cultivating, Rolling, and Harrowing.

Some of the Implements already described lend themselves to combination. Where this is the case we build Implements which will do the largest variety of work consistent with efficiency, two of which we here illustrate.

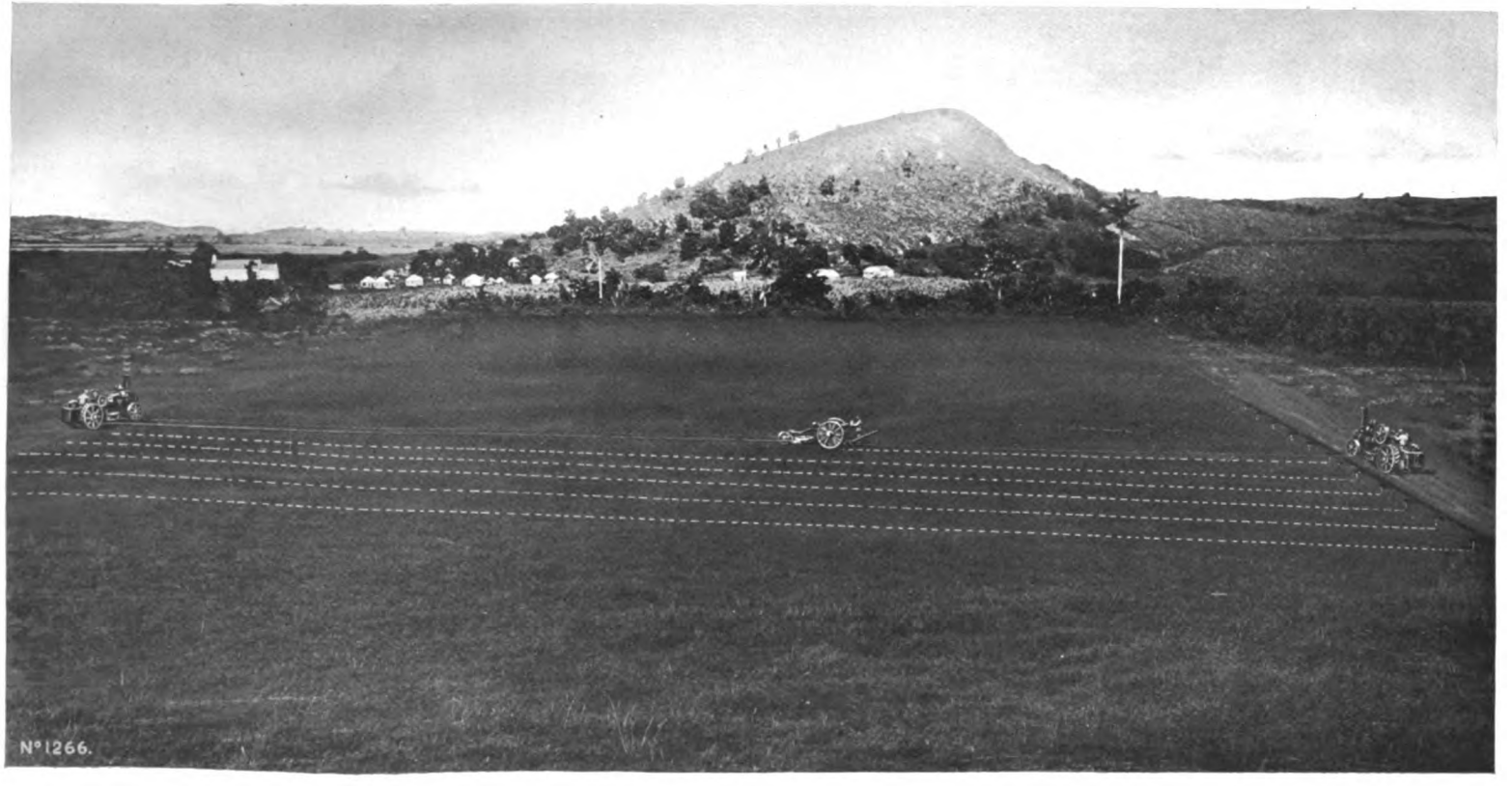
We manufacture these Implements to cover a width of from 6-ft. to 15-ft.

Combined Implement for Cultivating, Rolling, Seed Drilling, and Harrowing.

Mole Draining Machines

This implement is used for draining land with a strong clayey subsoil which prevents the surface water from getting away. The machine forms a duct with smooth sides, similar to a mole track, at any required depth up to 3-ft. ; the surface water drains into this and is carried away to the main drain.

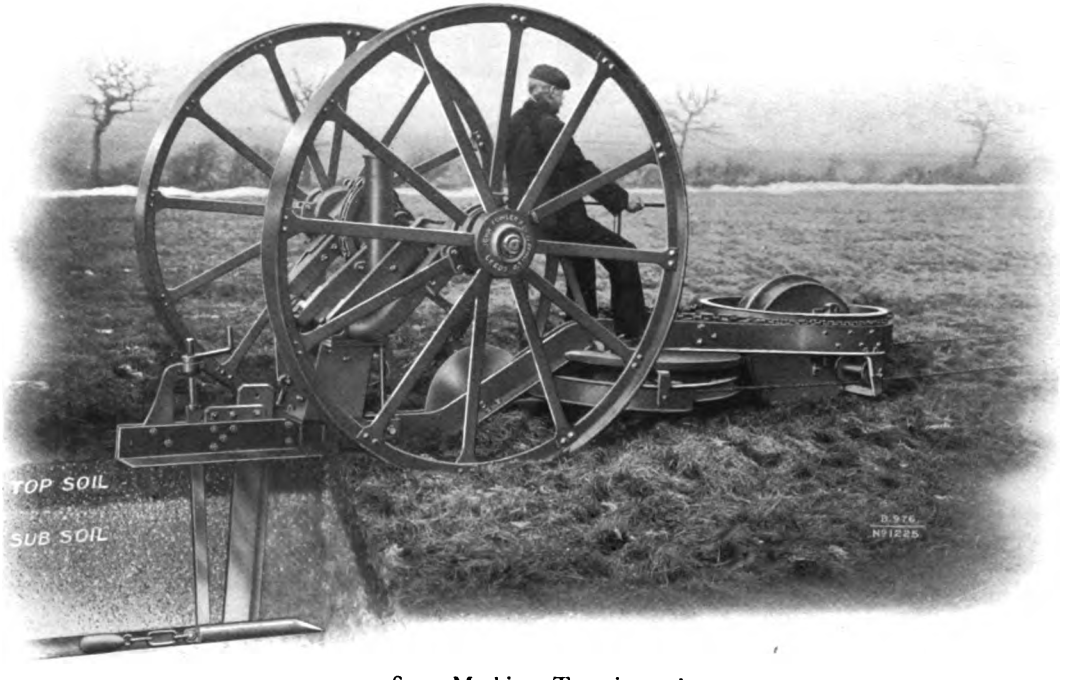
The best method of working is shown in the illustration below. The most satisfactory work is done on land which has a slight natural fall. A main drain is cut by hand along that side of the field to which the land slopes. If large areas have to be drained, this can be done much more expeditiously by using one of our special Ditching Machines as illustrated and described on pages 88 and 89. At right angles to the main drain, small excavations, known as "eyes," are made, as shown in the illustration, spaced at the required distance apart. The machine is then



Mole Draining Tackle at Work.

brought over each eye in turn and the mole dropped into work. On reaching the other end of the field, the mole is gradually lifted from the ground. After the field has been drained by this machine, the eyes and main drain are tiled and afterwards filled in and made good. Existing ditches are often used as main drains, in which case the eyes are cut in the side and the mole drains run direct into it. In these cases the main drain is not generally tiled, but one or two

Single-Frame Mole Draining Machine, fitted with Self-Acting Lifting Gear and Patent Cushioning Cylinder, Tyne lifted.

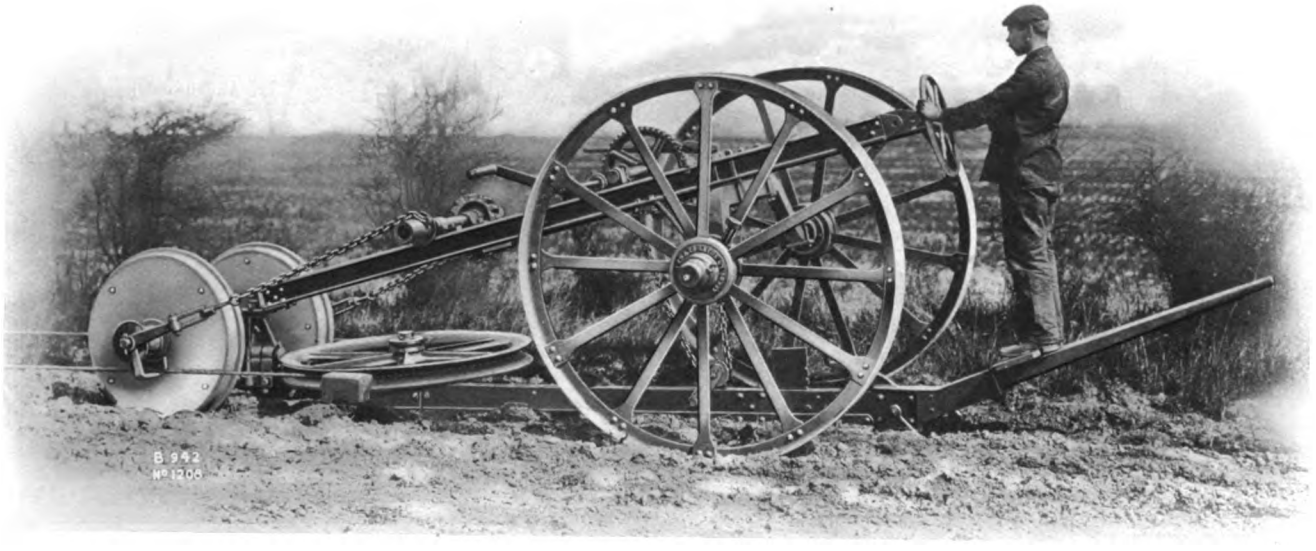


Same Machine, Tyne in work.

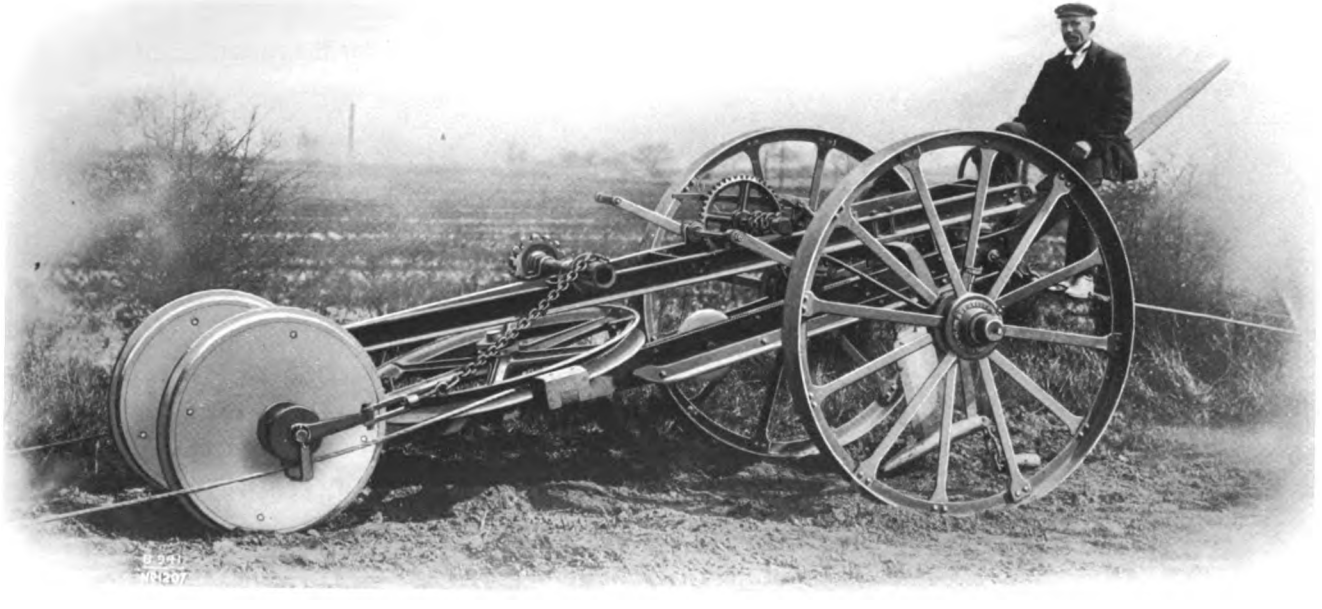
tiles are used for the ends of each mole drain. In some parts of this country drains cut by this implement have remained open for more than 20 years. Where the land is not so strong, however, it may be necessary to repeat the operation at lesser periods. The cost of draining by this method is but a small percentage of the cost entailed by laying pipe drains, and is much more effective.

We manufacture many varieties and sizes of this type of Implement, four of which are here illustrated.

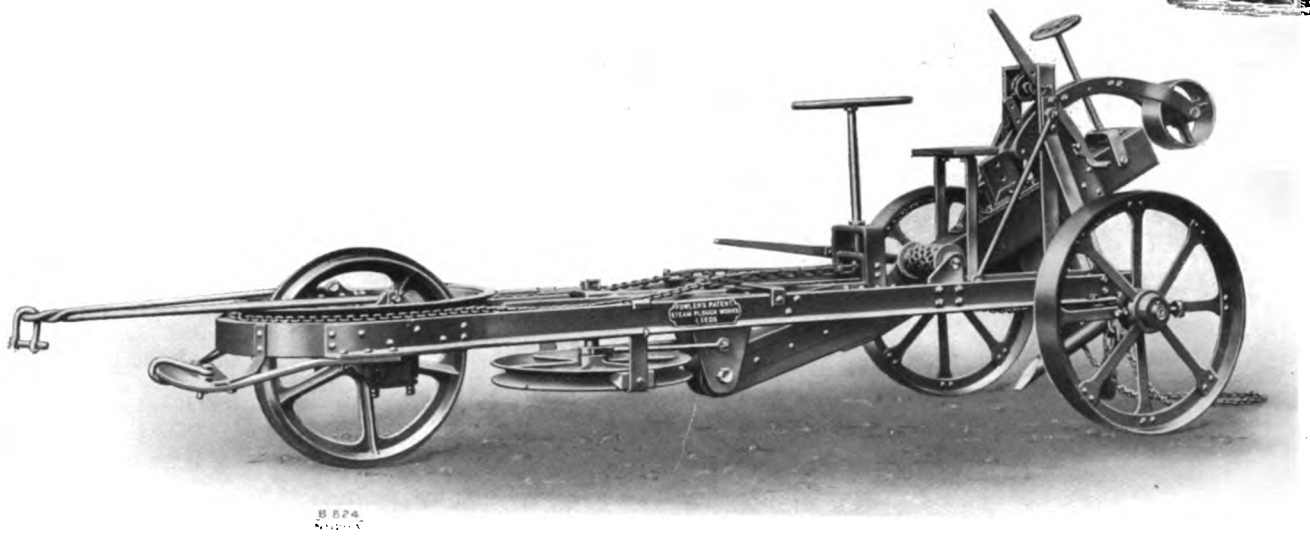
Mole Draining Machines (continued)



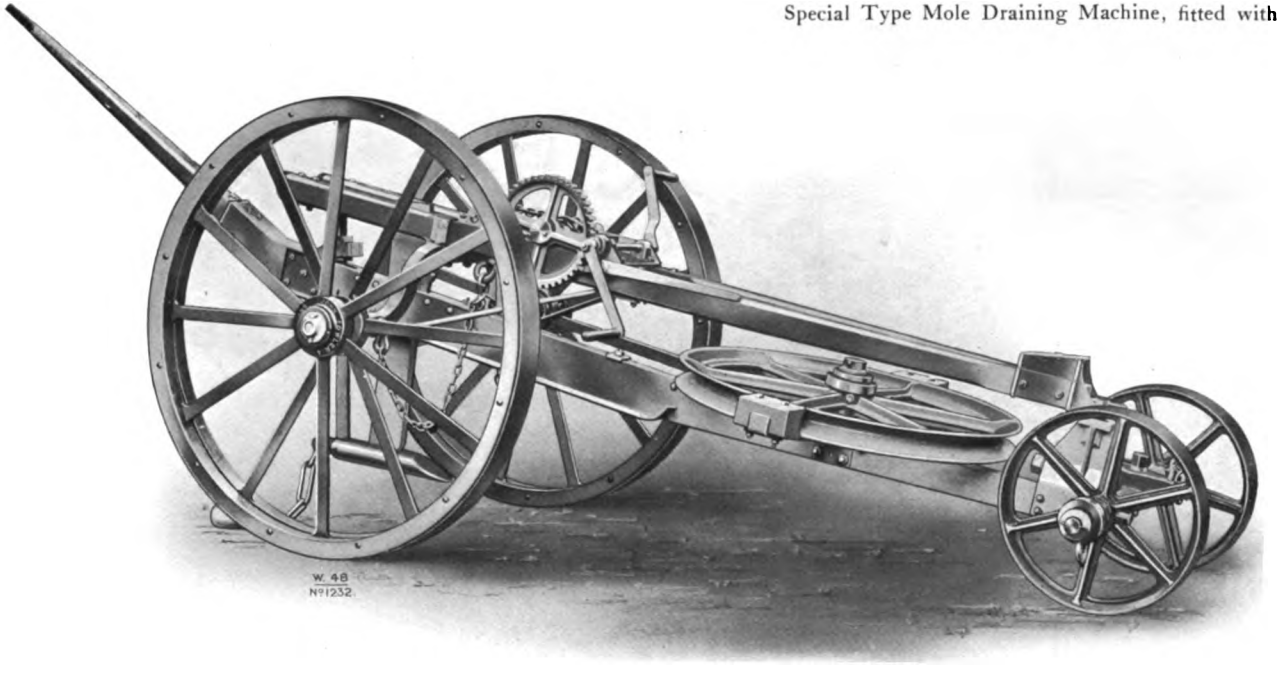
Latest Improved Double-Frame Mole Draining Machine, fitted with Hand Lifting Gear, Tyne in Work.



Same Machine, Tyne Lifted.



Special Type Mole Draining Machine, fitted with **Hand Lifting Gear.**



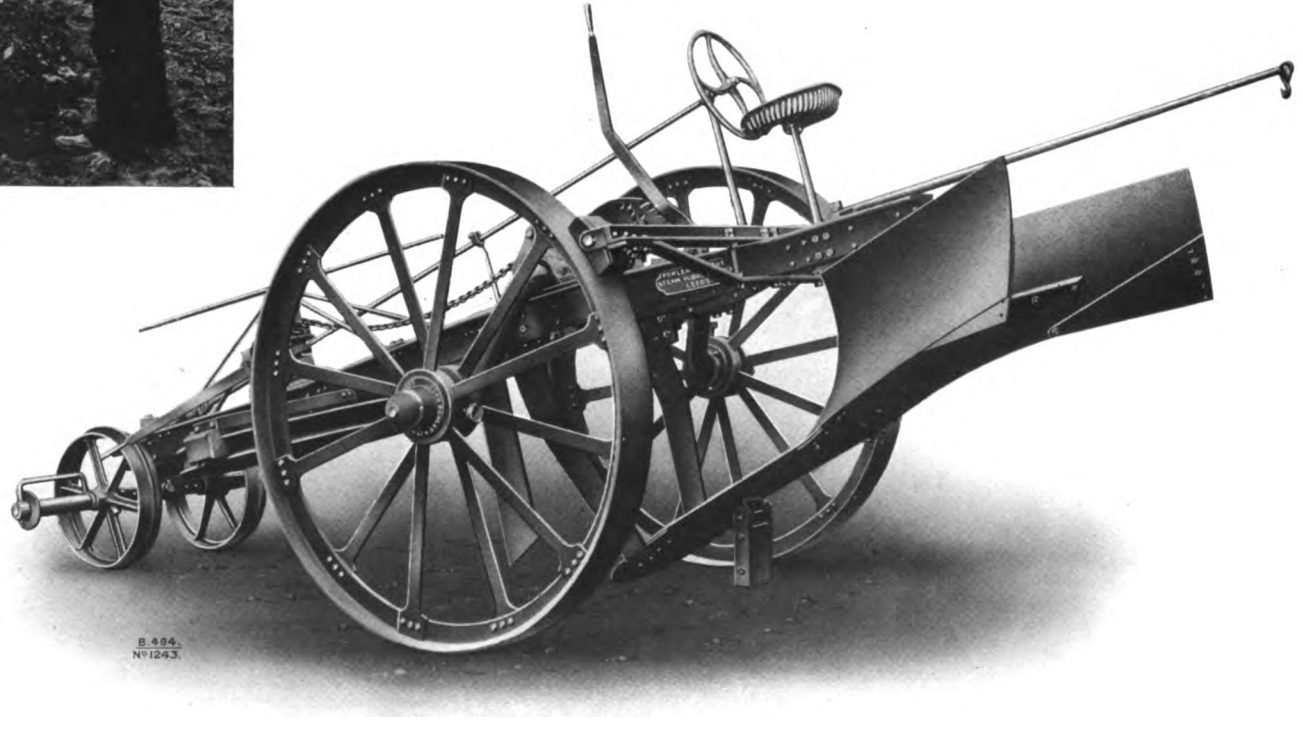
Double-Frame Mole Draining Machine, fitted with Hand Lifting Gear.

Trenching or Ditching Machines

A Finished Trench.

This Implement is used for opening wide drainage or irrigation ditches.

The front end of the frame is provided with a rope sheave round which the rope from one of the ploughing engines passes, the other end of the rope being fixed to the hind wheel of the same engine; thus the strain exerted by the engine on the implement is doubled.



A central coulter splits the mass of earth to be removed into two halves which are conveyed upwards by suitable mouldboards and deposited on both sides of the finished ditch.

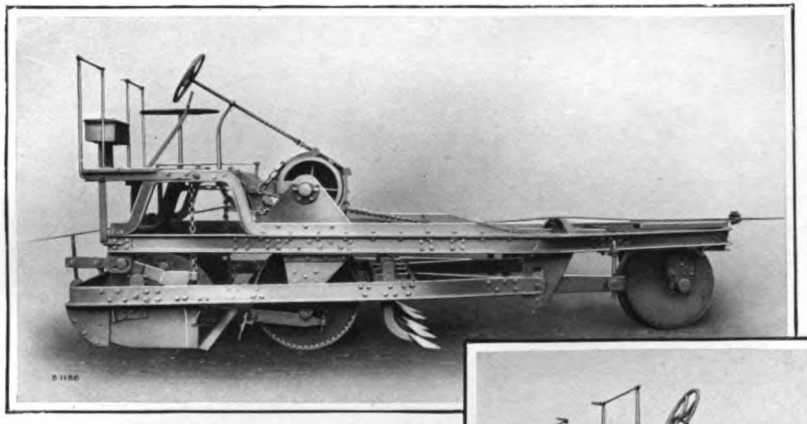
We manufacture several sizes of this machine to make trenches up to 2-ft. in depth and up to 3-ft. in width.

Trenching Machine at work.

Land Levellers

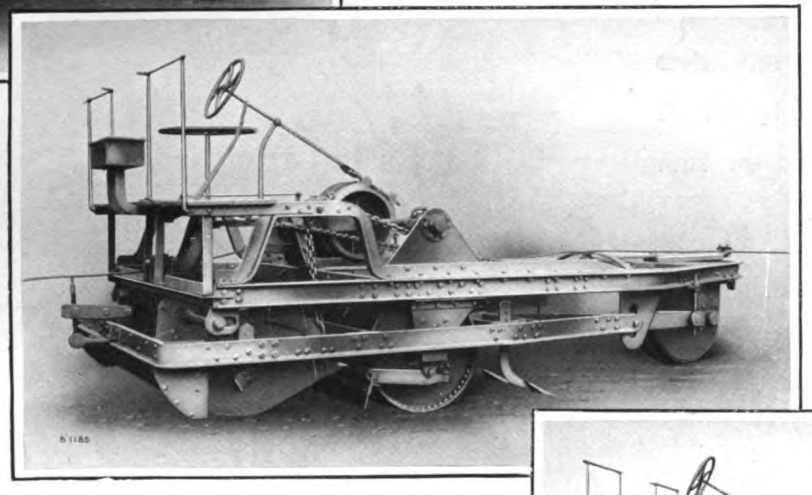
These Implements are used for grading or levelling undulating land, and are found exceptionally useful in countries where the crops depend upon irrigation for their water supply.

Land Levellers as generally manufactured involve the previous ploughing or cultivating of the land, to prepare it for the use of the Leveller. The implement shown here, however, combines the two operations, being fitted with broad cultivating tynes placed in front of the scoop which effectually break up the soil to the required depth.



Filling.

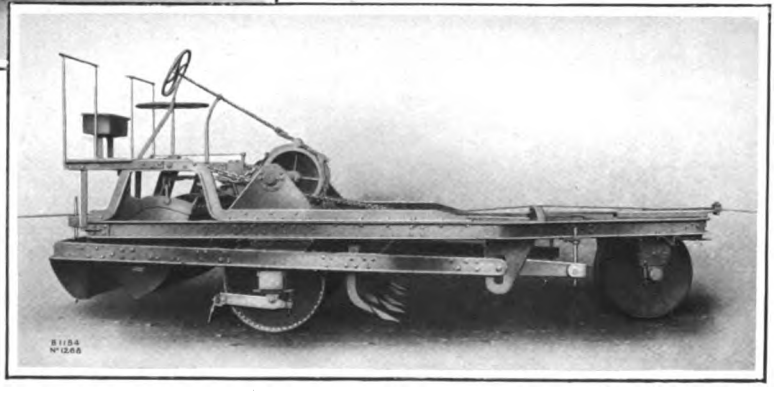
The illustrations here given show one of these Levellers in the positions of filling, carrying, and discharging.



Carrying.

The raising and lowering of the scoop is controlled by an efficient brake, thus obviating all jars and shocks. The machine throughout is of great strength, and all the movements are easily controlled from the steersman's seat.

We manufacture these Implements of various designs to suit the special conditions under which they have to work, and they are fully protected by patents.

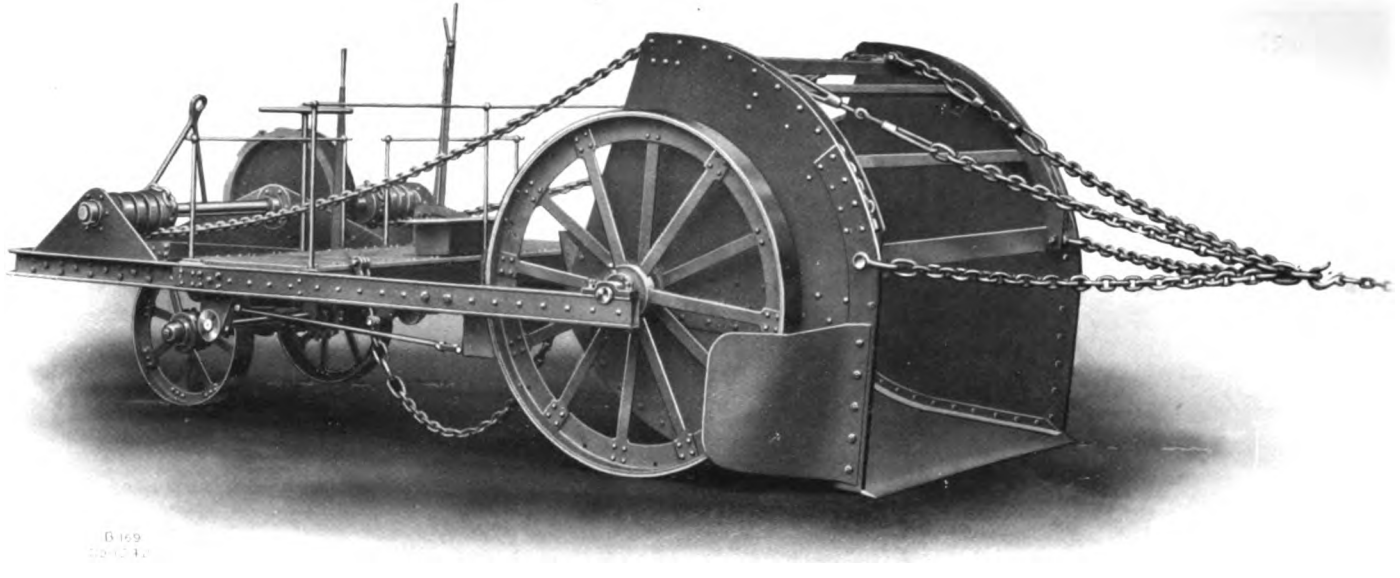


Discharging.

Scoops

These Implements are used to make artificial water holes or dams, and have been successfully adopted in Australia and other countries where the rainfall is intermittent. They are also used for cleaning ponds and rivers.

For excavating, the land is first ploughed, after which the scoop is pulled forward over it by one engine, automatically filling itself; it is then hauled back to the point of discharge and emptied by the other engine.

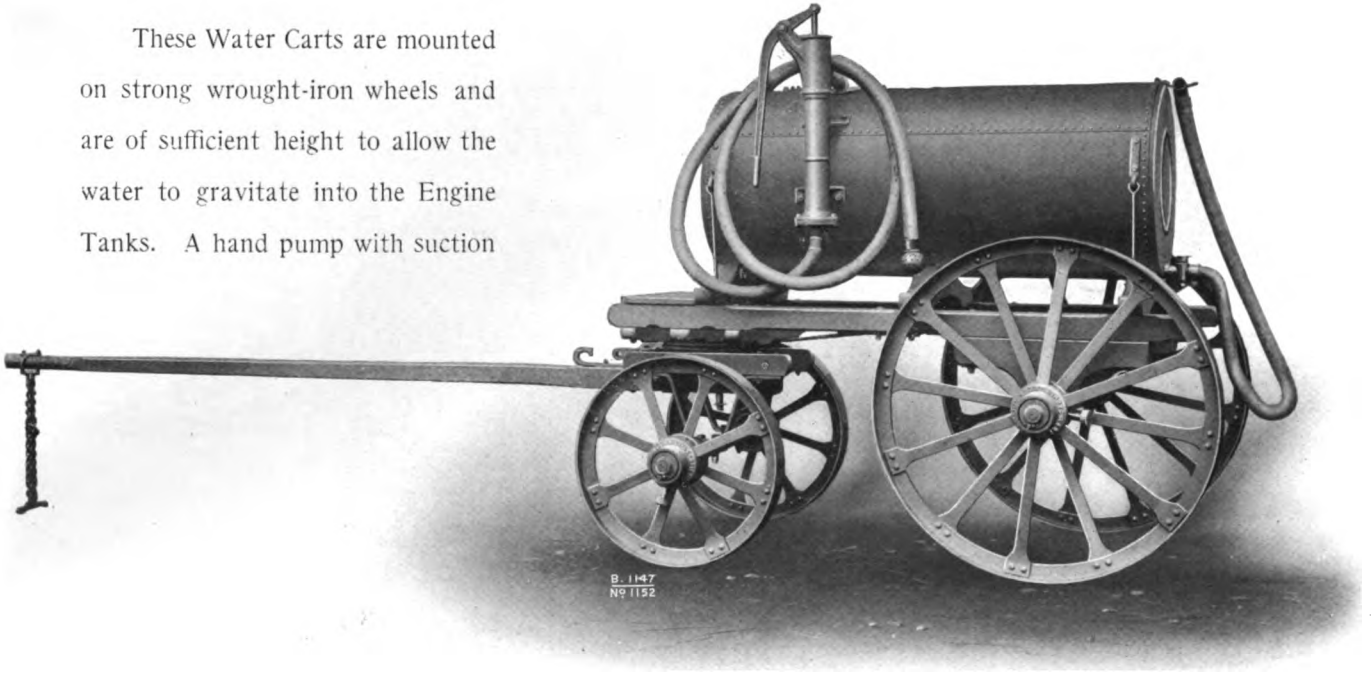


In Australia, Artificial Tanks have been constructed by this method, varying from 60 to 120 yards square, and from 5-ft. to 25-ft. in depth.

We manufacture several varieties and sizes varying in width from 3-ft. to 9-ft., and in capacity from 1 to 3 cubic yards.

Water Carts

These Water Carts are mounted on strong wrought-iron wheels and are of sufficient height to allow the water to gravitate into the Engine Tanks. A hand pump with suction



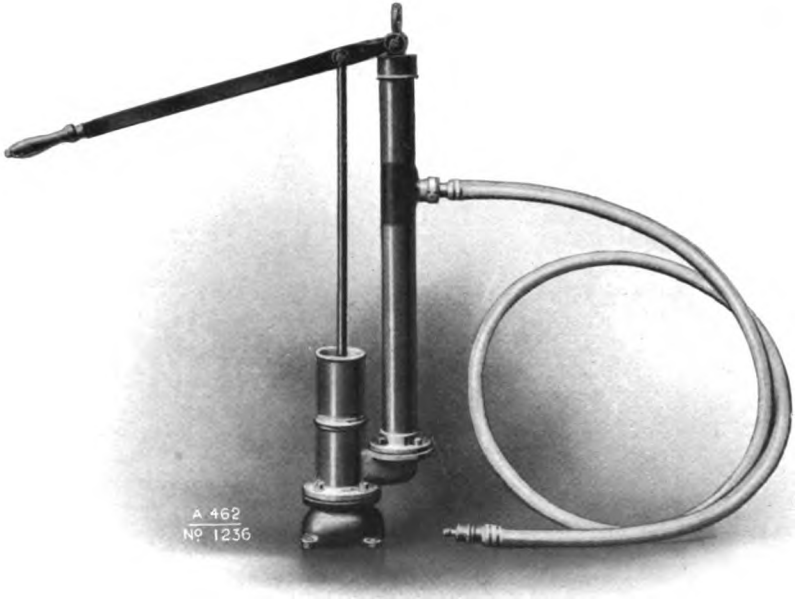
hose is fitted for filling. They can be supplied with either shafts for horses, pole for bullocks or dragbar for coupling to engines or implements.

We manufacture two types of Water Carts, Two-Wheeled and Four-Wheeled, with capacities of from 130 to 360 gallons.

Improved Sleeping Van for 5 or 6 Ploughmen.

We have been awarded several prizes at various Agricultural shows for the general excellence of these vans.

The Pump here illustrated is specially adapted for washing out the boilers of Ploughing and Traction Engines, and every set of Steam Cultivating Tackle should have one included with the outfit.



Wash-Out Force Pump.

GOLD CUP

Presented by the Right Hon. Lord Vernon, President of the Royal Agricultural Society of England, to be awarded "For the Best Combination of Machinery for the Cultivation of the Soil by Steam Power."

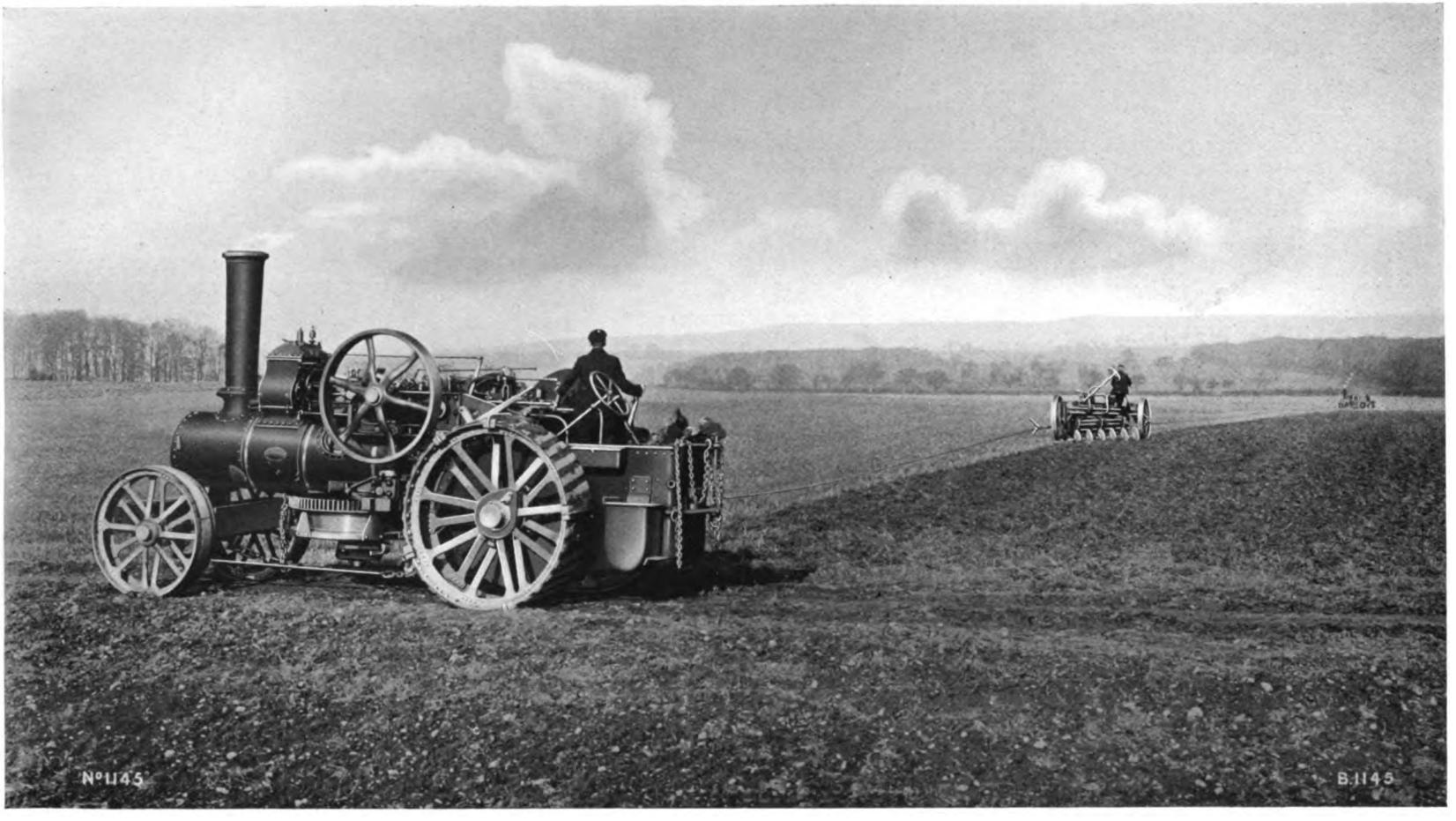
AWARDED TO JOHN FOWLER & CO.

TACKLES AT WORK

Reproductions from

Photographs of our Steam Cultivating Machinery

in different parts of the World



Fowler's Double-Engine System of Steam Cultivation.
Tackle at work on English Stubble Land.

Ploughing Engines in California.

The Engines under steam preparatory to starting out on the 1908 Campaign.

Beet Sugar Land under Cultivation in Colorado.

The illustration on the left shows one of our Tackles at work on an Hawaiian Sugar Estate. The lava rock shown in the foreground has been exposed by the Knifer.

The illustration on the right shows the same land after the removal of the lava rock, which has been used to build the wall which can be seen in the background.

Steam Cultivation in the Hawaiian Islands.

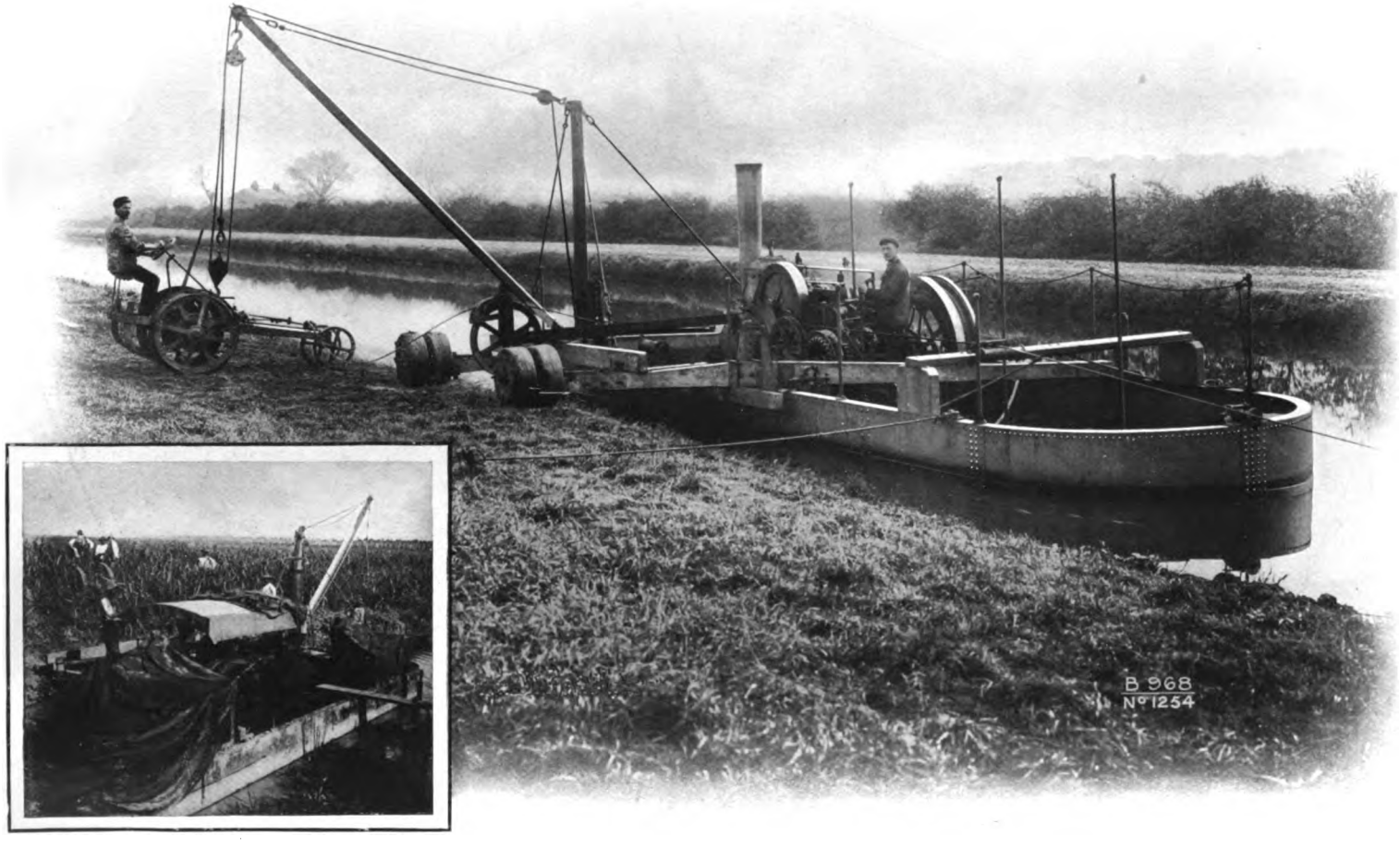
Breaking Plough at work on Sugar Cane Lands in Jamaica.

The pictures on this page show Tackles at work on a Sugar Cane Plantation. The one on the left shows a Harrow being prepared for use; in the background can be seen the light railway of the Estate and a growing crop of sugar cane. The picture on the right shows a pair of engines set for commencing ploughing on the cane stubble.

Steam Ploughing Tackles in the West Indies.

Turn-Round Plough at work on Undulating Land in England.

Sugar Cane Cultivation in Jamaica.
Reproductions of Snapshot Photographs of Tackles at work and on the road.

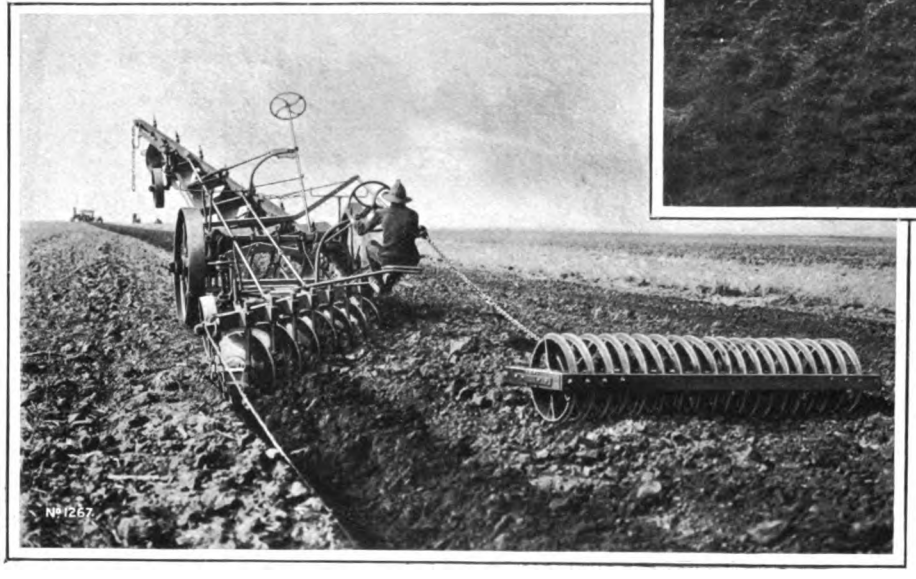


Punt Ploughing Tackle at work.

In certain parts of the West Indies the irrigation and drainage canals are made to serve as headlands, the Ploughing Engines being carried in suitable punts. The small inset is a reproduction of a photograph taken in the West Indies of one of these Tackles; in this picture the Implement used for cultivating between the cane rows can be seen emerging from the cane.

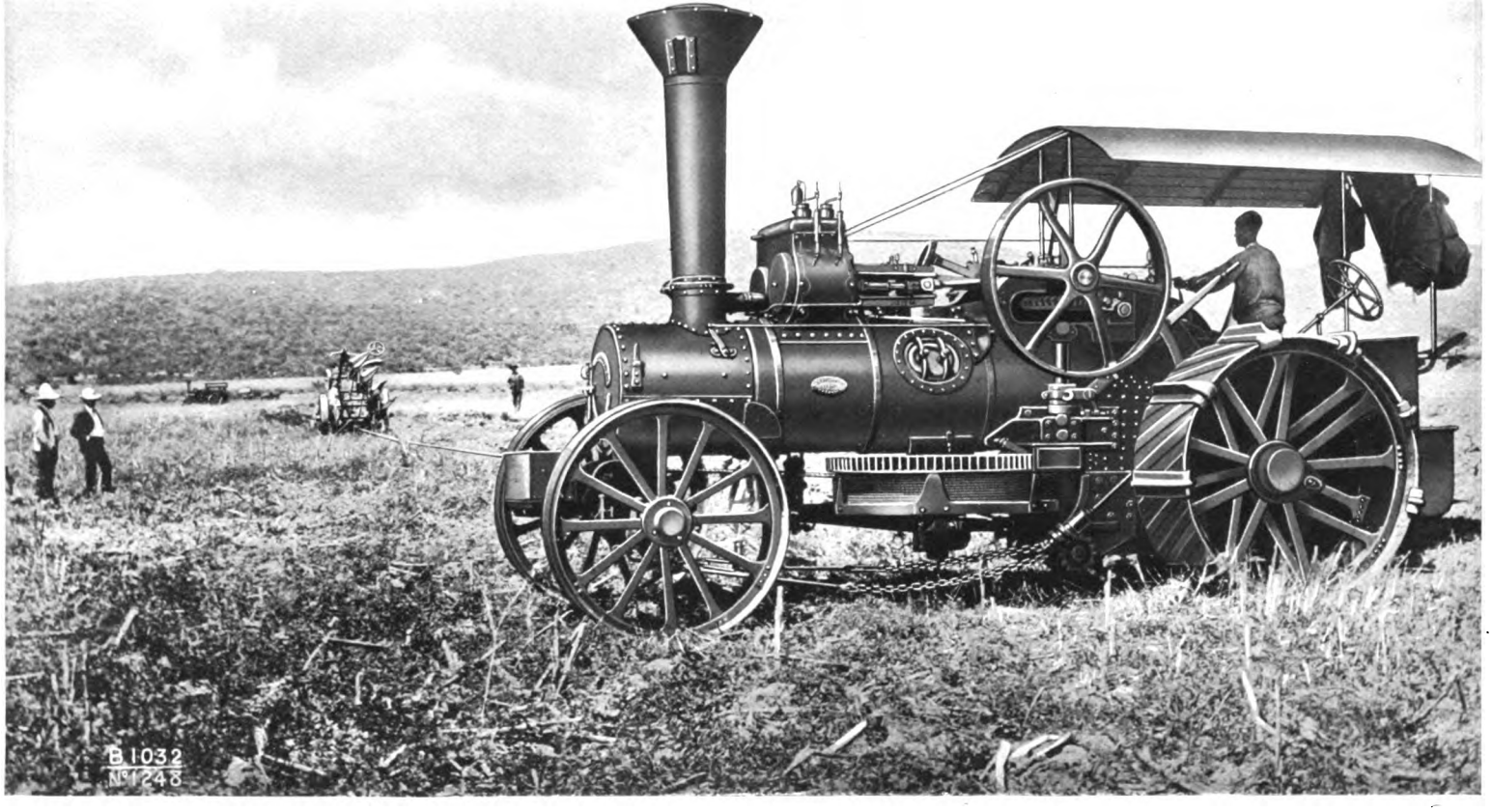
The photographs here reproduced show one of our Tackles at work on the Vereeniging Estates, Transvaal.

The picture on the right shows two sets of Harrows being operated by one Tackle; the Harrow in the foreground is connected to the Harrow which is just visible in the distance by a "dead" length of cable 400 yards long, the engine which can be seen on the horizon being 400 yards further on. In this manner a very large acreage can be harrowed per day.

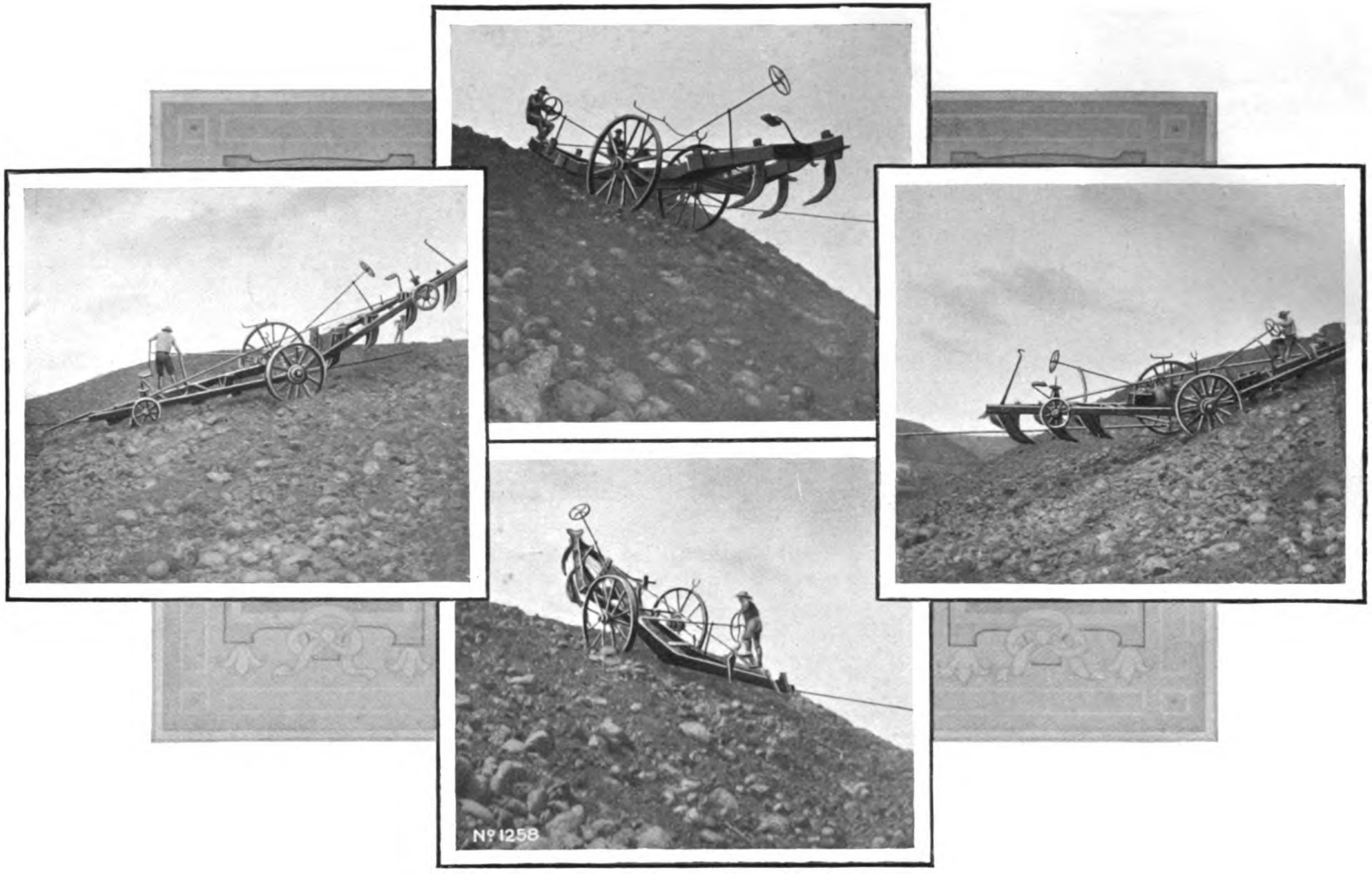


The picture on the left shows one of our Disc Ploughs trailing a roller.

Steam Ploughing Tackles in South Africa.

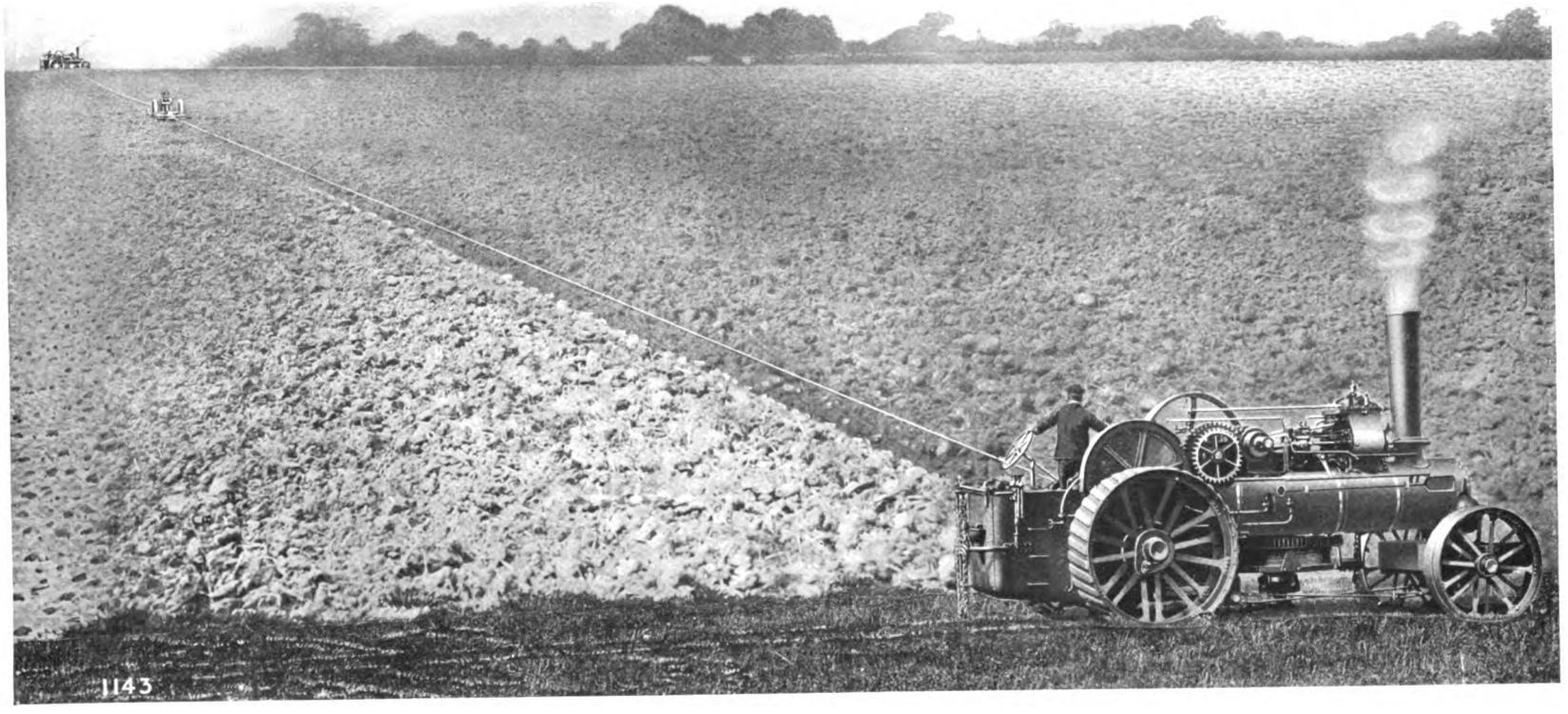


Breaking Plough at work on Sugar Cane Lands in Mexico.



Steam Tillage on Hill Sides.

The snapshot photographs reproduced above were taken in the Hawaiian Islands, and give a good idea of the sort of land which can be successfully cultivated by steam power. The land, in addition to being very hilly, is, as can be seen, strewn with boulders of lava rock.



Cross Cultivating on Ploughed Land in England.

Tackle at work on a Tobacco Plantation in Sumatra.

Reproductions of Photographs taken in Germany, showing the means by which a finished seed bed can be obtained at one operation. This is effected by combining the operations of Ploughing, Harrowing, and Surfacing. As shown in the illustrations a harrow and a surface dresser are attached to and trailed behind the plough.

Trenching Machine at work in Heavy Clay Land on a Cotton Plantation in German East Africa.

Ploughing Engine utilised for Tree Felling—clearing Forest Land for Cotton Cultivation near Saadani, German East Africa.

Ploughing Engine utilised for Thrashing.

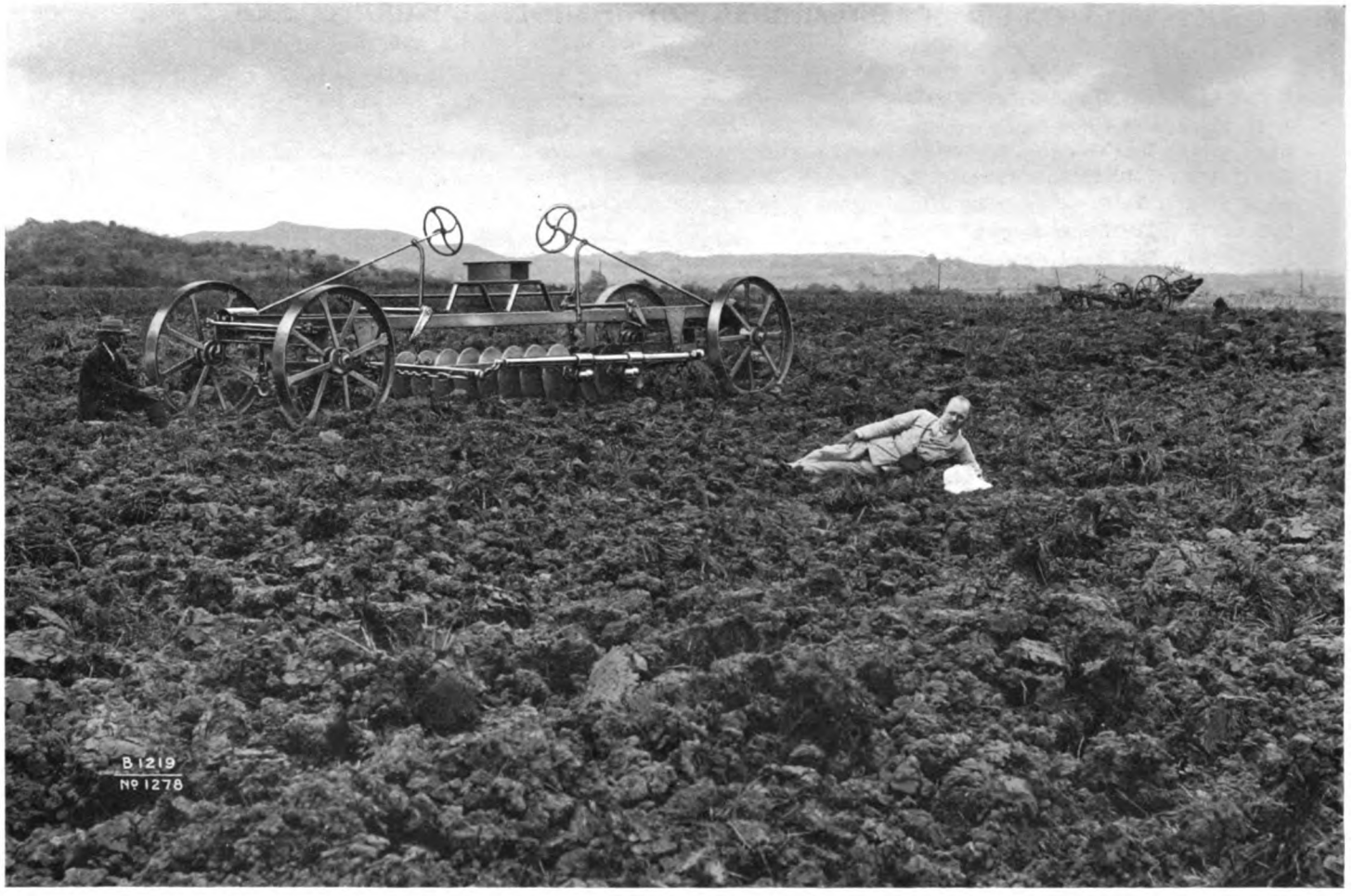
Any class of machinery to which power can be transmitted by belt can be driven by our Ploughing Engines. The photograph reproduced here shows one of our Strawburning Ploughing Engines driving a Thrashing Machine.

The illustrations shown on this and the opposite page are reproductions of photographs sent to us by the Manager of a Sugar Estate in Antigua, West Indies. Extracts from a letter sent with the photographs are as follows :—" The land is perhaps as unfavourable for tillage as any on earth, consisting of a dark yellow clay of

Tackle at work on a Sugar Estate in Antigua : The Land after Ploughing.

the toughest possible description, underlaid at a depth of about 8-in. by a white clay subsoil. The land was full of old sun cracks that had more or less filled in, giving it a hummocky appearance, and making it impossible to

ride over; it was probably in cultivation for cane in slavery days, but there is no record of its having been tilled during the last 40 years. In ploughing the clods are, as it were, torn out by the roots, breaking out a good deal deeper than the sole of the plough. By the use of the Discer the land is reduced to a workable condition. Where



The same Land after the Discer has been once over it.

your customers wish to reduce paving stones of dry clay to soil in good tilth you can safely recommend them this Discer." NOTE.—See also Disc Harrows, pages 80 and 81.

List of some of the Awards gained by John Fowler & Co. (Leeds), Limited, for their Manufactures.

Oct., 1857	**The Highland Society's Prize.**
July, 1858	**The Royal Agricultural Society's Prize.**
Aug., 1858	**The Yorkshire Agricultural Society's Prize.**
Aug., 1858	**Lord Bolton's Prize.**
Aug., 1858	**The Royal Agricultural Improvement Society of Ireland's Prize.**
Oct., 1858	**The Scotch Farmers' Prize.**
July, 1859	**The Royal Agricultural Society's Prize.**
Aug., 1859	**The Kent Agricultural Society's Prize.**
July, 1860	**The Royal Agricultural Society's Prize.**
Aug., 1860	**The Yorkshire Agricultural Society's Prize.**
July, 1861	**The Royal Agricultural Society's Prize.**
July 1861	**The Royal Agricultural Society's Prize** for the best set of Apparatus to be worked by ordinary Portable Engines.
Aug. 1861	**THE GOLD MEDAL** at the General Meeting of the German Agriculturists and Foresters, Mecklenburg-Schwerin.
Sept., 1861	**The Northamptonshire Agricultural Society's Prize.**
April, 1862	**THE GOLD MEDAL** of the Ayrshire Agricultural Society.
May, 1862	**THE PRIZE MEDAL** at the International Exhibition.
July, 1862	**The Northamptonshire Agricultural Society's Prize** for the best Plough.
July, 1862	**The Northamptonshire Agricultural Society's Prize** for the best Scarifier
Sept., 1862	**The Sparkenhoe Agricultural Society's Prize.**
Sept., 1862	**The Premium of 5,000 Dollars** given by the Colony of BRITISH GUIANA, for the best application of Steam Power to the Cultivation of the Soil.
Aug., 1863	**The Royal Agricultural Society's GOLD MEDAL and First Prize.**
Aug., 1863	**The Royal Agricultural Society's Prize** for the best application of the ordinary Portable Engine.
Aug., 1863	**The Hamburg International Agricultural Society's First Prize.**
Aug., 1863	**The Yorkshire Agricultural Society's Prize.**
Aug., 1863	**The Yorkshire Agricultural Society's Prize** for the best application of the ordinary Portable Engine.
Aug., 1863	**The North Lincolnshire Agricultural Society's Prize** for the best system of Steam Cultivation.
Aug., 1863	**The Gloucestershire Agricultural Society's Prize** for the best application of an 8 horse-power Engine.
Sept., 1863	**The Northamptonshire Agricultural Society's Prize** for the best Steam Plough
Sept., 1863	**The Northamptonshire Agricultural Society's Prize** for the best Steam Cultivator
Sept., 1863	**The Manchester and Liverpool Agricultural Society's Prize.**
Jan., 1864	**The Bengal Agricultural Society's Prize** for the best Steam Cultivating Apparatus

List of Awards (continued)

Jan.,	1864	**The Bengal Agricultural Society's Prize** for the best Double-Cylinder Engine.
Jan.,	1864	**The Bengal Agricultural Society's SILVER MEDAL** for the best Steam Plough.
July,	1864	**The Royal Agricultural Society's First Prize** for the best application of Steam Power for the Cultivation of the Soil.
July,	1864	**The Royal Agricultural Society's Second Prize** for the best application of Steam Power for the Cultivation of the Soil.
July,	1864	**The Royal Agricultural Society's First Prize** for the best application of Steam Power adapted for Small Occupations.
July,	1864	**The Royal Agricultural Society's First Prize** for the best Steam Plough.
July,	1864	**The Royal Agricultural Society's First Prize** for the best Steam Cultivator.
July,	1864	**The Royal Agricultural Society's First Prize** for the best Windlass for Steam Power.
July,	1864	**The Royal Agricultural Society's First Prize** for the best Anchor for Steam Power.
Aug.,	1864	**The Lincolnshire Agricultural Society's First Prize.**
Aug.,	1864	**The Lincolnshire Agricultural Society's Second Prize.**
May,	1865	**THE GOLD MEDAL** as **PRIZE OF HONOUR** of the Pomeranian Agricultural Society at the Universal Exhibition at Stettin.
May,	1865	**The Prize of 500 Thalers** for the best Steam Plough at ditto.
June,	1865	**The Prize of 150 Fdks. d'Or** at the International Exhibition at Cologne, for the best Steam Plough.
June,	1865	**The Prize of 500 Thalers,** ditto, for the best Traction Engine.
Aug.,	1865	**THE SILVER MEDAL** for an 8 horse-power set of Steam Cultivating Machinery, at the Meeting of the Manchester and Liverpool Agricultural Society.
Aug.,	1865	**THE GOLD MEDAL** of the Yorkshire Agricultural Society.
Aug.,	1867	**THE GOLD MEDAL** at the French Universal Exhibition.
Aug.,	1867	**THE SILVER MEDAL** of the Yorkshire Agricultural Society.
Feb.,	1868	**The Louisiana (U.S.) State Fair PREMIUM DIPLOMA and First Prize** " For the best Traction or Locomotive Steam Engine for Farm or Plantation use, adapted to all purposes."
Feb.,	1868	**The Louisiana (U.S.) State Fair PREMIUM DIPLOMA and First Prize.** " For the best practical working arrangement of Gang Ploughs, for Breaking Up and Preparing Ground for planting, to be drawn by Steam Power."
July,	1868	**THE GOLD CUP** offered by His Highness the VICEROY OF EGYPT, at the Royal Agricultural Society's Meeting at Leicester, " For the best Implement for the Cultivation of the Soil by Steam Power, combining strength with simplicity of construction, for use in Foreign Countries where skilled labour for repairs is difficult to be procured."
July,	1868	**The Royal Agricultural Society's First Prize** for the best Double Set of Steam Cultivating Apparatus.
July,	1868	**The Royal Agricultural Society's Second Prize** for the best Single Set of Steam Cultivating Apparatus.
July,	1868	**The Royal Agricultural Society's Second Prize** for the best Single Set of Steam Cultivating Apparatus (8 horse-power Engine).
July,	1868	**The Royal Agricultural Society's First Prize** for the best 4-Furrow Balance Plough.
July,	1868	**The Royal Agricultural Society's First Prize** for the best 7-Tyne Balance Cultivator.
July,	1868	**The Royal Agricultural Society's First Prize** for the best Light Land Cultivator.
July,	1868	**The Royal Agricultural Society's First Prize** for the best Frame for Harrows, Rollers, etc.

List of Awards (continued)

July, 1868	**The Royal Agricultural Society's First Prize** for the best Disc-Travelling Anchor.
July, 1868	**The Royal Agricultural Society's First Prize** for the best Double-Drum Windlass on Engine.
July, 1868	**The Royal Agricultural Society's First Prize** for the best Clip-Drum Windlass on Engine.
Aug., 1868	**THE SILVER MEDAL** of the Yorkshire Agricultural Society.
July, 1871	**The Royal Agricultural Society's First Prize** for the best Combination of Machinery for the Cultivation of the Soil by Steam Power.
July, 1871	**The Royal Agricultural Society's Second Prize** for the best Combination of Machinery for the Cultivation of the Soil by Steam Power.
July, 1871	**The Royal Agricultural Society's First Prize** for the best Combination of Machinery for the Cultivation of the Soil by Steam Power, the weight of the Steam Engine not to exceed ten tons.
July, 1871	**The Royal Agricultural Society's First Prize** for the best Combination of Machinery for the Cultivation of the Soil by an ordinary Agricultural Engine, whether self-propelling or portable.
July, 1871	**The Royal Agricultural Society's First Prize** for the best Plough, suitable for Steam Cultivation.
July, 1871	**The Royal Agricultural Society's First Prize** for the best Subsoiler, suitable for Steam Cultivation.
July, 1871	**The Royal Agricultural Society's First Prize** for the best Digger, suitable for Steam Cultivation.
July, 1871	**The Royal Agricultural Society's First Prize** for the best Cultivator, suitable for Steam Cultivation.
July, 1871	**The Royal Agricultural Society's First Prize** for the best Skim Plough or Scarifier, suitable for Steam Cultivation.
July, 1871	**The Royal Agricultural Society's First Prize** for the best Root or Stone Extractor.
July, 1871	**The Royal Agricultural Society's Prize** for the best Implement or part of Tackle suitable for Steam Cultivation of any description, not qualified to compete in the preceding classes.
July, 1871	**The Royal Agricultural Society's Silver Medal** for Ditching Plough (extra prize).
July, 1871	**The Royal Agricultural Society's Gold Cup**, offered by the Right Hon. LORD VERNON, President, for the best Combination of Machinery for the Cultivation of the Soil by Steam Power, the cost of which shall not exceed £700; the Engine to be Locomotive, and adapted for Thrashing and other Farm purposes.
July, 1871	**THE SILVER MEDAL** of the Highland and Agricultural Society of Scotland for the best Traction Engine.
Sept., 1871	**THE SILVER MEDAL** of the Manchester and Liverpool Society for the best Traction Engine.
1873	**THE MEDAL OF PROGRESS** at the Vienna Exhibition for Traction Engine.
April, 1873	**SILVER MEDAL** of the Ayrshire Agricultural Society for Traction Engine.
May, 1873	**SILVER MEDAL** of the Glasgow Agricultural Society for Traction Engine.
Aug., 1873	**SILVER MEDAL** of the Preston Agricultural Society for Traction Engine.
Aug., 1873	**SILVER MEDAL** of the Highland Agricultural Society for Traction Engine.
Aug., 1873	**SILVER MEDAL** of the Royal North Lancashire Agricultural Society for Traction Engine.
Sept., 1873	**SILVER MEDAL** of the Manchester and Liverpool Agricultural Society for Traction Engine.
Sept., 1873	**SILVER MEDAL** of the Staffordshire Agricultural Society for Traction Engine.
1873	**THE DIPLOMA OF HONOUR** at the International Exhibition, held at Vienna, for Steam Cultivating Machinery.
April, 1874	**THE SILVER MEDAL** of the Ayrshire Agricultural Society for Traction Engine.

List of Awards (continued)

June, 1874	**THE FIRST PRIZE** at the International Exhibition, held at Bremen, for best Set of Steam Cultivating Machinery.
June, 1874	**THE FIRST PRIZE** at the International Exhibition, held at Bremen, for best Steam Plough for Reclaiming Waste Land.
July, 1874	**THE ROYAL AGRICULTURAL SOCIETY'S FIRST PRIZE** for best Van for men engaged in Steam Cultivation.
July, 1874	**THE ROYAL AGRICULTURAL SOCIETY'S SILVER MEDAL** for Patent Four-Wheel Windlass.
July, 1874	**THE SILVER MEDAL** of the Highland and Agricultural Society of Scotland for Steam Cultivating Machinery.
July, 1874	**THE SILVER MEDAL** of the Highland and Agricultural Society of Scotland for "Sutherland" Plough.
April, 1875	**THE SILVER MEDAL** of the Ayrshire Agricultural Society for Traction Engine.
May, 1875	**THE GOLD MEDAL OF MERIT** at the Markisch Agricultural Society's Show in Prussia.
July, 1875	**THE PRIZE OF £25** at the Manchester and Liverpool Society's Show for Steam Cultivating Machinery.
Sept., 1875	**THE GOLD MEDAL** of the North Shropshire Agricultural Society for Double-Engine Set of Steam Cultivating Machinery.
Sept., 1875	**THE SILVER MEDAL** of the Northamptonshire Agricultural Society for 6-horse Double Engine Set of Steam Cultivating Machinery.
April, 1876	**THE SILVER MEDAL** of the Ayrshire Agricultural Society.
Sept., 1876	**THE SILVER MEDAL** of the Manchester and Liverpool Agricultural Society for Improvements to Steam Ploughs.
Sept., 1876	**THE SILVER MEDAL** of the Long Sutton Agricultural Society for Double-Engine Set of Steam Cultivating Machinery.
April, 1877	**THE SILVER MEDAL** of the Ayrshire Agricultural Society.
1878	**THE SILVER MEDAL** of the Long Sutton Agricultural Society.
July, 1878	**THE ROYAL AGRICULTURAL SOCIETY'S SILVER MEDAL** for Steam Ploughing Engine, fitted with Church's Patent Valve.
Sept., 1878	**THE SILVER MEDAL** of the Royal Manchester and Liverpool and North Lancashire Society.
1878	**THE SILVER MEDAL** at the Paris Universal Exhibition.
1878	**PARIS UNIVERSAL EXHIBITION.—THE ONLY GRAND PRIX AND GOLD MEDAL** for best exhibit of Steam Ploughing Machinery.
1879	**THREE FIRST SPECIAL PRIZES** (including **GOLD MEDAL**), at **SYDNEY UNIVERSAL EXHIBITION**, for best exhibit of Steam Cultivating, Traction, and other Machinery.
July, 1879	**THE GOLD MEDAL** of the United East Lothian Agricultural Society.
Sept., 1879	**A SPECIAL ADDRESS** in acknowledgment of the excellent performances of Fowler's Double-Engine System of Steam Cultivation, at the trial of Steam Ploughs in Czakowitz, near Prague.
May, 1880	**THE DIPLOMA OF HONOUR and GOLD MEDAL** at the Bohemian Farmers' Club Show, in Prague.
June, 1880	**THE LARGE SILVER STATE MEDAL** at the Show of the Central Agricultural Society of the Prussian Province of Saxony, held at Magdeburg.
June, 1880	**FIRST PRIZE and GOLD MEDAL** at the Trials of Steam Cultivating Machinery, held at Melun, France.

List of Awards (continued)

Dec., 1880	**FIRST PRIZE** at the Otago Agricultural and Pastoral Society's Show at Dunedin, New Zealand, for Steam Traction Engines.
July, 1881	**SPECIAL PRIZE OF HONOUR** offered by the Right Hon. Count Otto zu Stolberg-Wernigerode, Vice-Chancellor of the German Empire, at the International Agricultural Exhibition in Hanover.
July, 1881	**DIPLOMA OF MERIT and GOLD MEDAL** for Steam Ploughing Machinery and Traction Engines, at the International Agricultural Exhibition in Hanover.
Aug., 1881	**DIPLOMA and GOLD MEDAL** of the Bohemian Agricultural Society, at their Show in Chrudim, for excellence of Single and Double-Engine Steam Ploughing Tackles.
Sept., 1881	**THE SILVER MEDAL** of the Long Sutton Agricultural Society for exhibit of our Patent Portable Tramway.
Dec., 1881	**FIRST PRIZE** at the Otago Agricultural and Pastoral Society's Show at Dunedin, New Zealand, for Steam Traction Engines.
1881	**FIRST PRIZE** at the Taieri Agricultural Show at Mosgiel, New Zealand, for Steam Traction Engines.
1881	**FIRST PRIZE and SILVER MEDAL** at the Tokomairiro Farmers' Association Show at Milton, New Zealand, for Steam Traction Engines.
May, 1882	**FIRST PRIZE.**—The Silver Medal at the East Priegnitz Agricultural Society's Meeting at Pritzwalk, in the Prussian Province of Brandenburg, for the excellent results given by our Steam Ploughing Machinery.
Sept., 1882	**SPECIAL DIPLOMA** of the Vienna Agricultural Society, at Lundenberg, Moravia, for the excellent Work performed by Steam Ploughing Machinery.
Sept., 1882	**THE GREAT GOLD MEDAL OF THE SOCIETY, and 500 Frcs. in Gold,** of the Hungarian "Landes Agricultur Verein," at Budapest, Agard, for our Double-Engine Ploughing System.
Sept., 1882	**THE GREAT GOLD MEDAL OF THE STATE, and 300 Frcs. in Gold,** at the Hungarian "Landes Agricultur Verein," at Budapest, Agard, for our Single-Engine System.
June, 1883	**THE SILVER MEDAL** at Wirrall Show.
1884	**FIRST PRIZE** at the **CALCUTTA EXHIBITION** for Narrow Gauge Locomotives.
1884	**FIRST PRIZE** at the **CALCUTTA EXHIBITION** for Light Railways.
1885	**GOLD MEDAL** for Compound "Undertype" and Traction Engines, at the **INTERNATIONAL INVENTIONS EXHIBITION, LONDON.**
1887	**THE SILVER MEDAL** of the **ROYAL AGRICULTURAL SOCIETY** for New Patent 7-furrow Sectional Balance Plough fitted with Patent Anti-balance Gear.
June, 1887	**THE LARGE SILVER MEDAL** of the **ROYAL AGRICULTURAL SOCIETY OF GERMANY,** for New 7-furrow Steam Plough with Patent Anti-balance Gear.
Oct., 1890	**THE LARGE GOLD STATE MEDAL** at the **GENERAL AGRICULTURAL AND FORESTRY SHOW,** in **VIENNA,** in **AUSTRIA,** for prominent merits in Steam Cultivation.
June, 1894	**THE LARGE SILVER MEDAL** of the **ROYAL AGRICULTURAL SOCIETY OF GERMANY** for New Patent Turning Plough.
June, 1894	**THE HIGHEST AWARD IN THE COMPETITION** for New Implements, **ROYAL AGRICULTURAL SOCIETY OF ENGLAND.**
1900	**GRAND PRIX** for Steam Cultivating Machinery and Traction Engines, **PARIS INTERNATIONAL EXHIBITION.**
1904	**GRAND PRIX** for Traction Engines, **ST. LOUIS PURCHASE EXHIBITION.**